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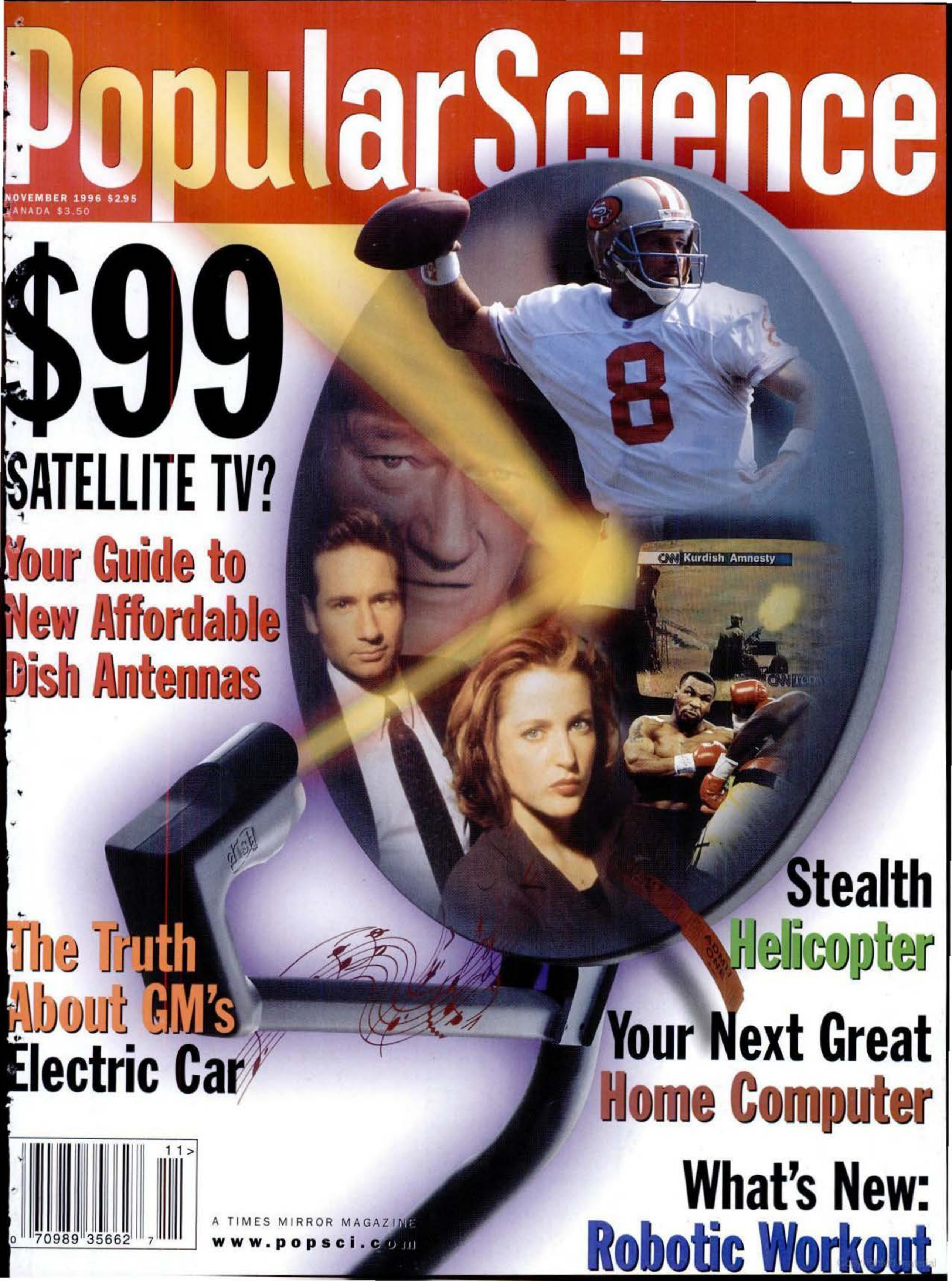

$99 SATELLITE TV?
Your Guide to New Affordable Dish Antennas

The Truth About GM's Electric Car

Stealth Helicopter

Your Next Great Home Computer

What's New: Robotic Workout

A TIMES MIRROR MAGAZINE
www.popsci.com

ALL COMPUTERS HAVE A BRAIN.
OURS HAVE A SOUL.

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There are computers that satisfy your needs. And then there are those that satisfy your desires. Introducing the Compaq Presario home collection. Besides its many innovations and all-around cool design, it's also the first home computer line that was actually designed for the home user.

For example, the collection comes equipped with custom-built JBL Pro speakers* for the same brilliant, high-fidelity sound you've always enjoyed from your home stereo. The Presario line also features Easy Access Buttons at your fingertips to instantly launch your most used applications. Plus a 33.6Kbps modem** for the fastest Internet access available over standard phone lines. What's more, each computer is tailored to meet your particular interests and requirements.

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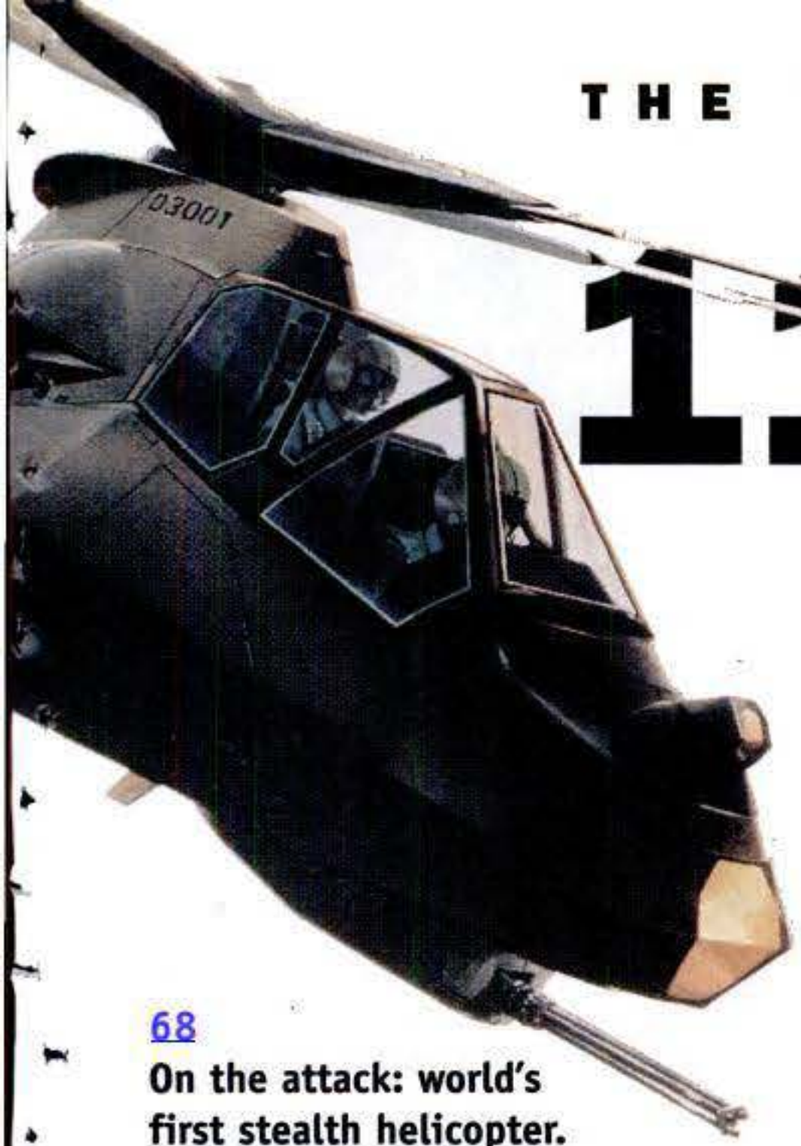

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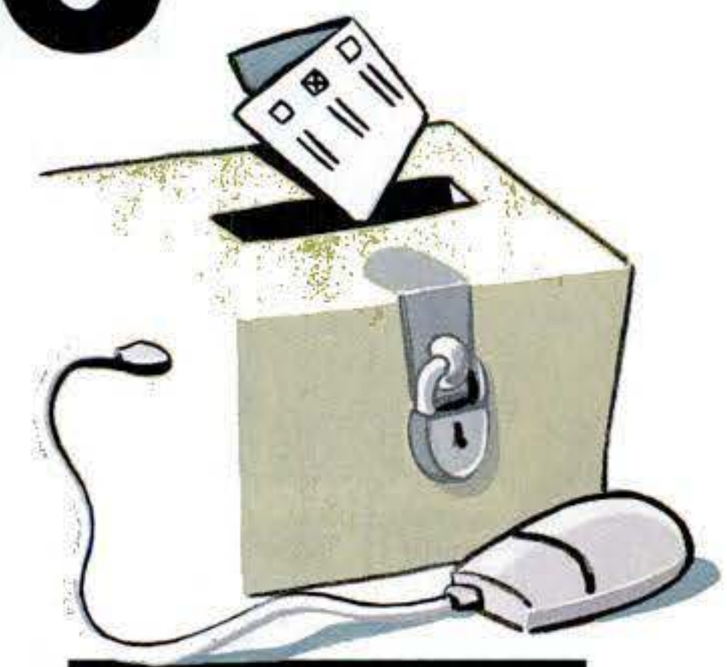

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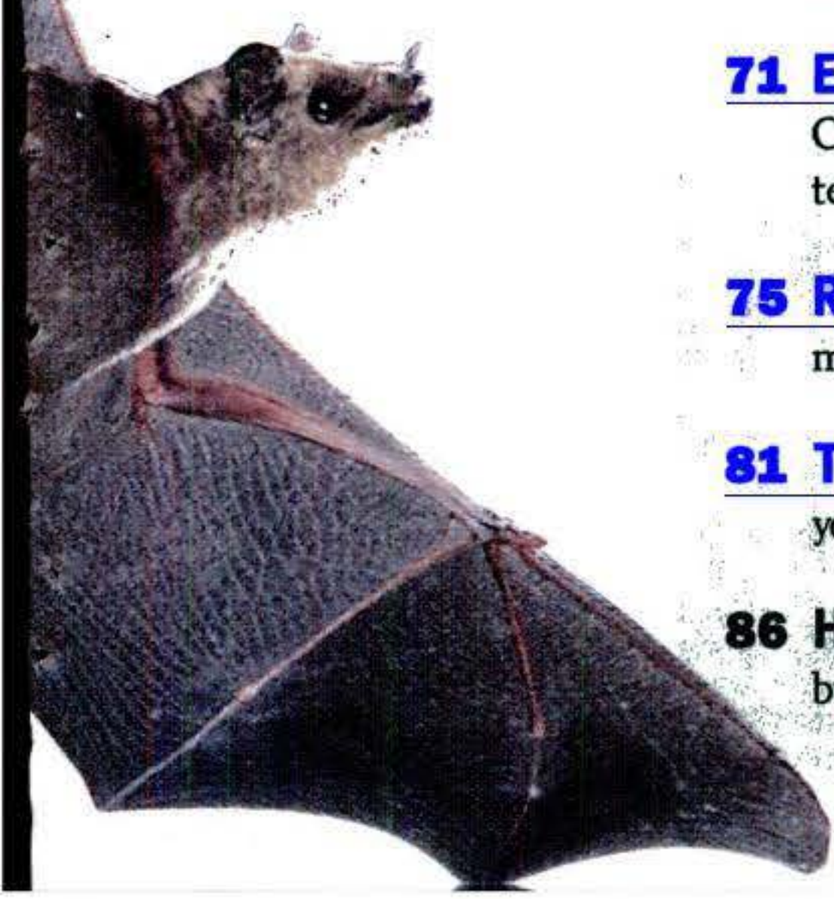

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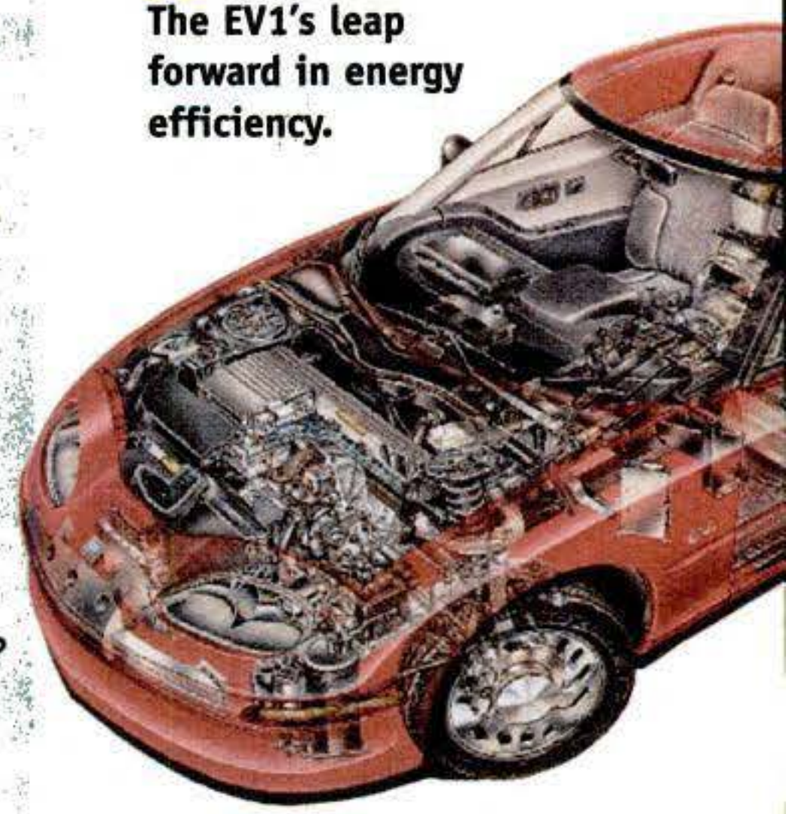

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MARK DEAN, ***Production Specialist, races late model stock cars with his brother in his spare time.***

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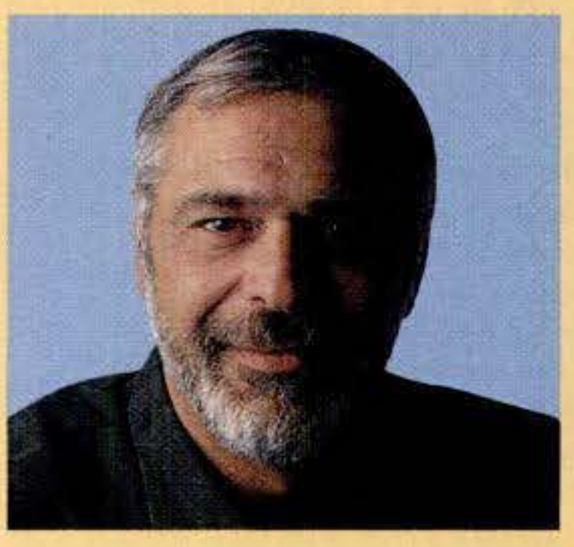

If You Wait, You'll Be Late

IF YOU'VE BEEN HOLDING OFF on the hottest home entertainment product in recent memory—satellite TV antennas—you've hedged a good bet. Prices on the dishes and program services have dropped far and fast in less than two years. But don't delay a second longer—not even for the $99 offering that looms as the next sortie in a raging price war. Even at current prices, little-dish antennas are sure to be in limited supply. My recommendation: Check out our roundup of the new generation of dishes and receivers that are easier to install, cheaper to buy or lease, and richer in programming. Then, snap one up and thumb your nose at that cable provider that's been giving you fits.—*Fred Abatemarco,* **popscied@aol.com**

Bulky Batteries

WHY NOT UNPLUG from the obsession of portable tools with self-contained batteries ["Unplugged!" Sept.]? A battery pack clipped to the belt and a reliable coiled connecting cord adaptable to several tools could be the solution to many problems discussed in your article. If manufacturers continue with this cordless mania, financing will be requried to buy a gorilla to operate these "handy" designer dumb bells.

James Hunter
Lancaster, Calif.

Internet Decency

GINA SMITH ADMITS that the Communications Decency Act is a bad idea, so she suggests worldwide government control of the Internet to control access to information that may be inappropriate or indecent [Beyond Here, Sept.]. Unbelievable! The Internet has brought hope to millions of people controlled by despotic governments. One should be careful with "solutions" to problems that will harm even more people in the end.

Larry Gross
Spotsylvania, Va.

A SUGGESTION for parents who can't use their child's computer: Take the machine to a computer store and have them install online-blocking software.

Nicholas Barnard
nickb@dnaco.net

I'M A 12-YEAR-OLD boy and I'm more interested in science than photos of sexy women on the Web.

Kory G. Wilcox
Nixa, Mo.

NEITHER YOU, nor I, nor the government has the primary responsibility in every activity of someone else's child. That must remain the responsibility of the parent.

kitchm@aol.com

IF IT CAN BE SAID or printed on paper, why not cyberspace?

bman676@wow.com

Flag Waving

I WAS SURPRISED to see that Hong Kong and Taiwan were described as being in China [What's New, Aug.]. To complete the illusion, the flag of the People's Republic of China was next to the news briefs.

Mario De Lemos
mdelemos@unixg.ubc.ca

The Chinese flag was meant to link some of the What's New items with the rest of the issue on China.

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Educational Warfare

MANY PEOPLE miss the deadly point about the gear covered in "Warfare in the Information Age" [July]. The sole purpose of these items is to make our armies more efficient killers. Any item termed "defensive" is merely to sustain troop strength, allowing a counter-attack later. Weapons are never a deterrent against violence. Instead, education is the greatest deterrent—although defense budgets are usually larger than education budgets. These war gadgets and new technologies may look like they are miracles of science, but a real miracle would be seeing an entire country become literate.

Paul Silverstein
Phillipsburg, N.J.

Mountains of Abuse

"MISSY IN ACTION" [July] should have mentioned the damage done to the mountain trails that these thrill-seekers hurtle down with such unthinking abandon. If they wish to experience a real chill, they should don a backpack and, while trudging one of these scenic trails, become a casualty of one of their own kind's heedless mountain-biking plunges down a trail. The damage to the trail must also be repaired by a dedicated non-thrill-seeking trail builder.

Robert M. Haage
Montclair, Calif.

It's in the Asking

"ADDICTED TO the Net" [Computers & Software Newsfront, July] cites a survey—conducted on the Internet—that concludes that some people spend too much time on the Net, and that they may even be addicted. This reminds me of an old Burns and Allen routine where she tells him that her uncle is taking a survey to determine how many people have telephones. "And how many do?" George asks. Gracie tells him, "Everyone he called."

Michael Kurland
103204.306@compuserve.com

A Variety of Days

YOUR ANSWER about the sun setting later in Orlando than in New York [FYI, July] implies that the sun will always set (and rise) at the same time for any given point along a given longitude. This would be true if Earth's axis did not tilt 23° 27'. Because of this tilt, the sun doesn't set (or rise) at the same time along the entire length of a given longitude.

Michael Shandony
San Francisco, Calif.

You're right. We forgot to account for the length-of-day variation with changes in latitude.

Corrections: The Lynx concept by European Ford has a 1.7-liter engine ["Cool Cat," What's New, Sept.].

In "Bridge Over a Troubled Infrastructure" [Science & Technology Newsfront, July], the name of the research institution that developed the composite bridge is Lawrence Technological University.

An image of the Iceman incorrectly accompanied an item about Peking Man in Science & Technology Newsfront [Aug.].

Motorola's Mall Sport 7's ["What's New," Sept.] cost $139 apiece, not per pair, and the Sport 7X models costs $169 apiece, not per pair.

China imported $1.2 billion worth of fertilizer in 1995, not $45.6 billion, which was its total for all imports in 1995 ["The Facts," FYI, Aug.].

The Long March begun in 1934 by Chinese Communists was conducted to avoid the Chinese Nationalists, not because of pursuit by the Japanese during World War II ["Booster Rocket Blues," Science & Technology Newsfront, Aug.].

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WHAT'S NEW

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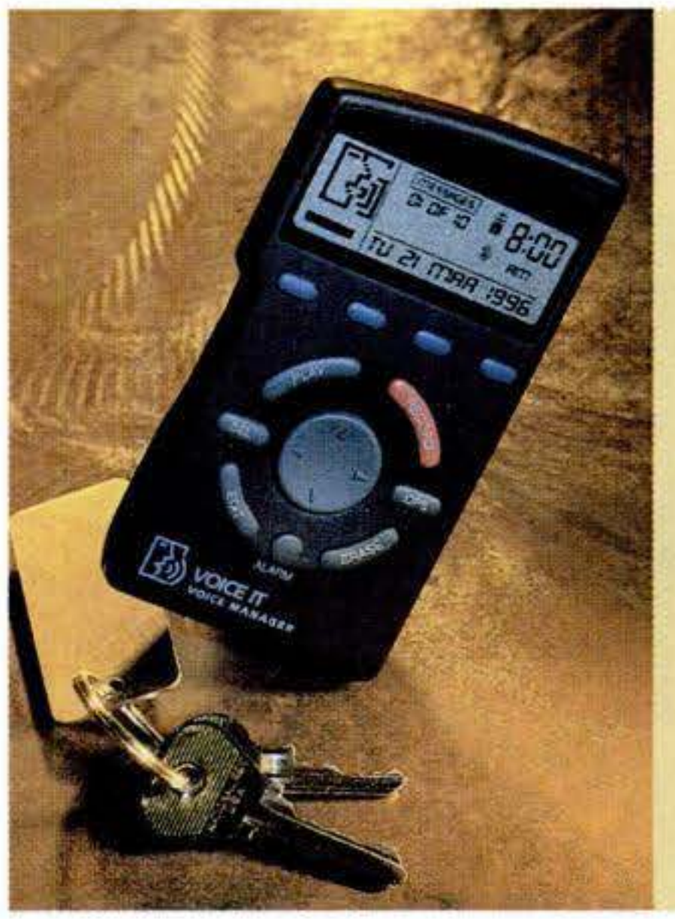
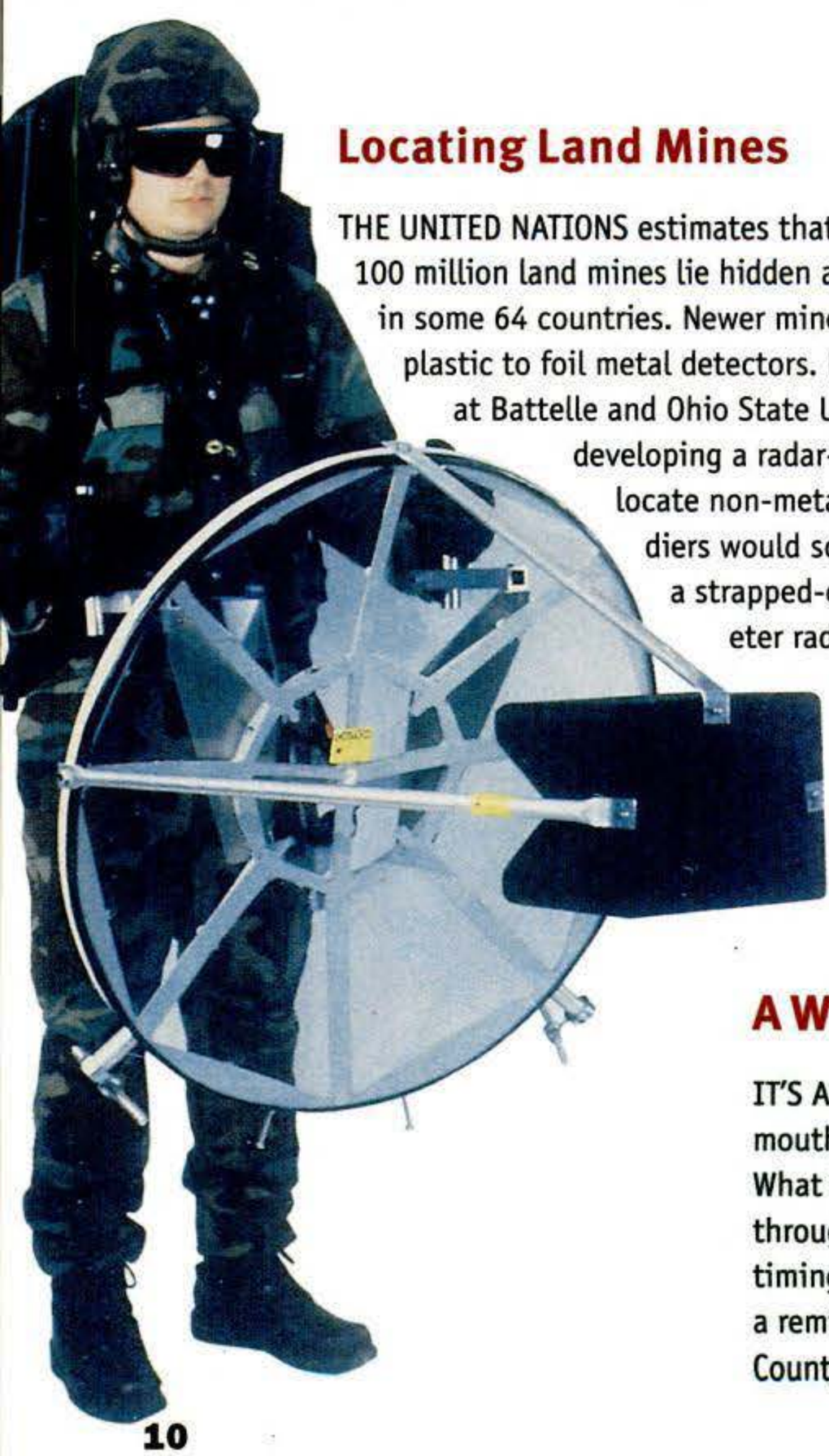


Digital Dictation

SOMEWHERE between a digital recorder and an organizer is Voice It Manager. The palm-size recorder is able to hold 22 minutes (about $130) or 45 minutes (about $170) of recording, store 100 names with three telephone numbers apiece, and then dial the numbers using touch-tone signals. Voice It Worldwide, 2643 Midpoint Dr., Suite A, Fort Collins CO 80525.



Locating Land Mines

THE UNITED NATIONS estimates that more than 100 million land mines lie hidden and unexploded in some 64 countries. Newer mines are encased in plastic to foil metal detectors. Now researchers at Battelle and Ohio State University are developing a radar-based system to locate non-metallic mines. Soldiers would scan an area with a strapped-on 30-inch-diameter radar dish. Battelle, 505 King Ave., Columbus OH 43201-2693.

For the Jet Set

BEGINNING FLIGHTS this fall, the Global Express is said to be the fastest business jet in the skies. Manufactured by Bombardier Aerospace Group of Montreal, maker of the Learjet, the $35 million Global Express carries up to 19 passengers cruising at speeds as high as 581 mph. At a slightly slower speed, the jet has a maximum range of 7,480 miles.

A Way to Get Prompt Advice

IT'S AN EMERGENCY. Can you remember the steps for CPR, mouth-to-mouth resuscitation, or the Heimlich maneuver? What if the victim is a baby? CPR Prompt literally talks you through the steps of these lifesaving procedures and provides timing cues for chest compressions and breathing. It even flashes a reminder to practice the steps every 45 days. Price: about $100. County Line Ltd., 4543 Taylor Lane, Warrensville Heights OH 44128.

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Cordless Cut

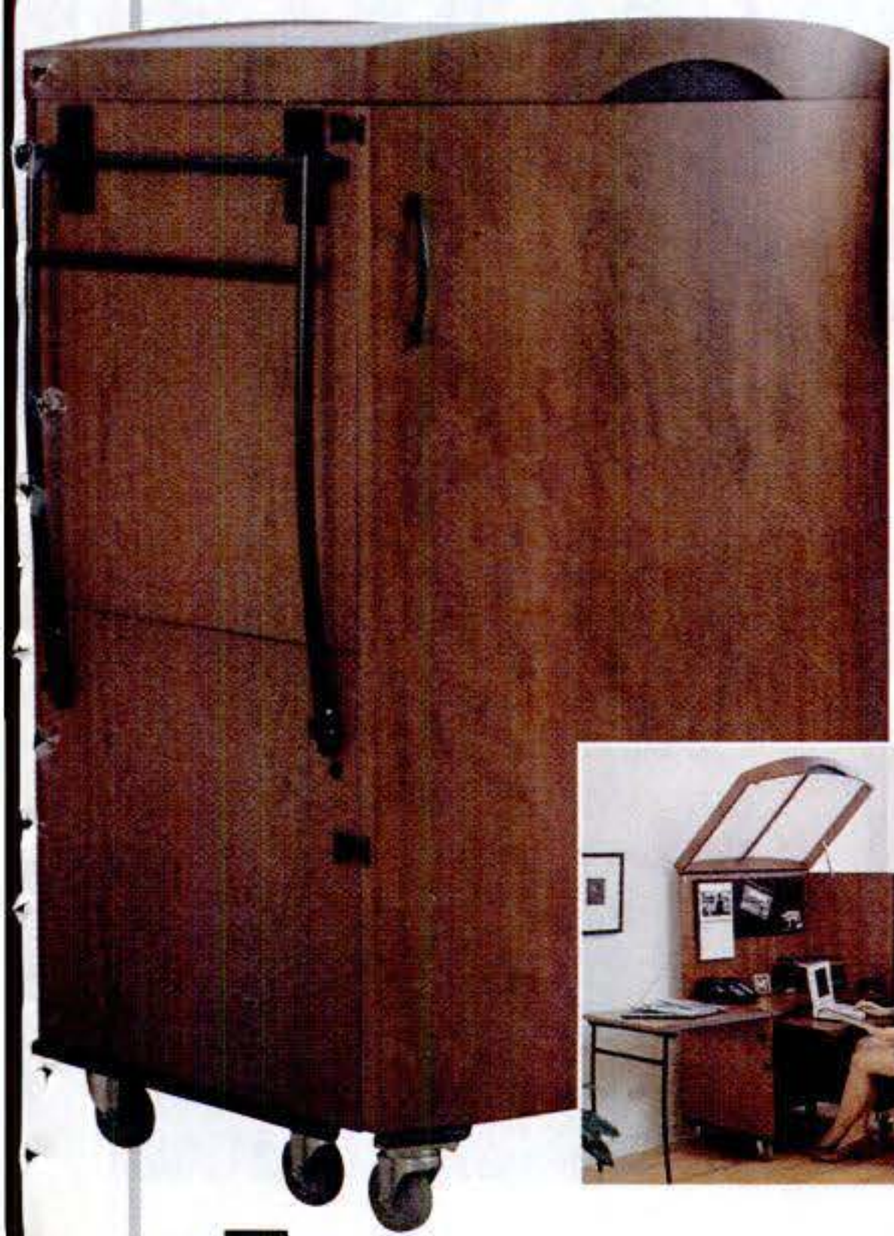
WHAT WEIGHS ONLY 3.8 pounds and is just over a foot long? The world's first 12-volt cordless chainsaw, of course. The Makita Model UC120DW cuts up to 26 pieces of 2 3/8 by 2 3/4 pine on one charge; it handles lumber as thick as 4 1/2 inches. Available around December, the saw will cost about $250 with the charger. (The exact price has not yet been set.) Makita U.S.A., 14930 Northam St., La Mirada CA 90638-5753.

Fueled by the Sun

SOLAR TWO IS AN experimental $189 million solar-thermal project. The electric generating plant uses 1,900 mirrored panels to reflect sunlight to heat a molten-salt mixture of sodium and potassium nitrate to 1,050°F. The salt can be used immediately or stored to heat water in a steam generator for powering turbines. Located in the Mojave Desert, the plant generates 10 megawatts, enough for 10,000 homes, at about 10 cents per kilowatt-hour. Southern California Edison, 6090 Irwindale Ave., Irwindale CA 91702.

The Bike Radio

USING A PERSONAL stereo system with headphones while biking is illegal in some states. Now Alpina installs the stereo on the frame and speakers on the handlebars. The unit works with just about any Walkman-type personal stereo and weighs just 7.8 ounces. Price ranges from $75 to $90. BYCO Inc., Box 3001, Dallas TX 75370.



Office to Go

FOR THE HOME entrepreneur or mobile manager, Haworth's Correspondent is an office in a box that unfolds to 14 square feet of work space for a computer, printer, fax machine, and phone. Weighing less than 200 pounds, this office on wheels also comes with a tackboard and a markerboard—and even the markers. The price is from $1,500 to $2,000, depending on options. Haworth, One Haworth Center, Holland MI 49423.

Spying Eyes

CYCLISTS, RUNNERS, or skaters can keep an eye on the trailing competition with the Spy, a tiny—3/8 of an inch in diameter—mirror that adheres inside eyewear. The Spy's ball-and-socket configuration works with a variety of eyewear designs and provides a surprisingly wide-angle view. Price: about $10. CycleAware, 323 Spreckels Dr., Suite D, Aptos CA 95003.

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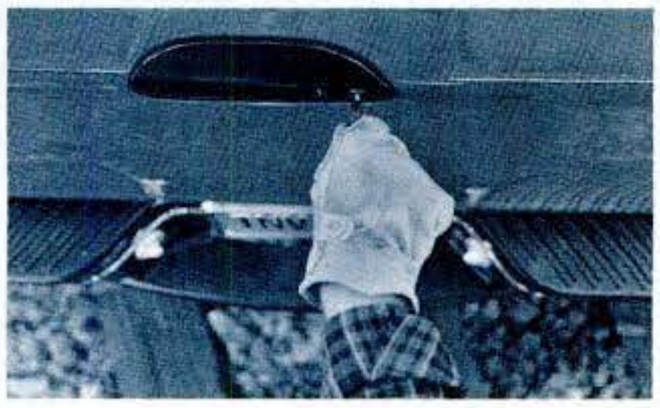

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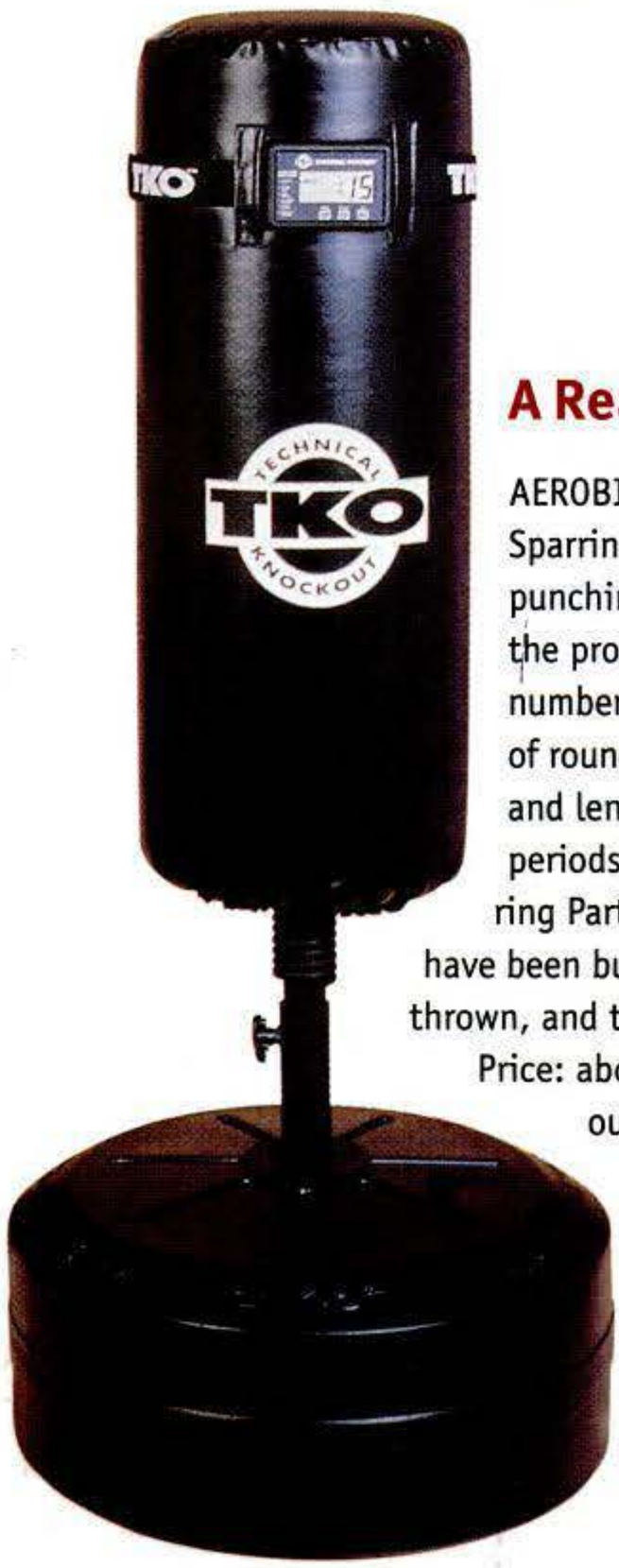
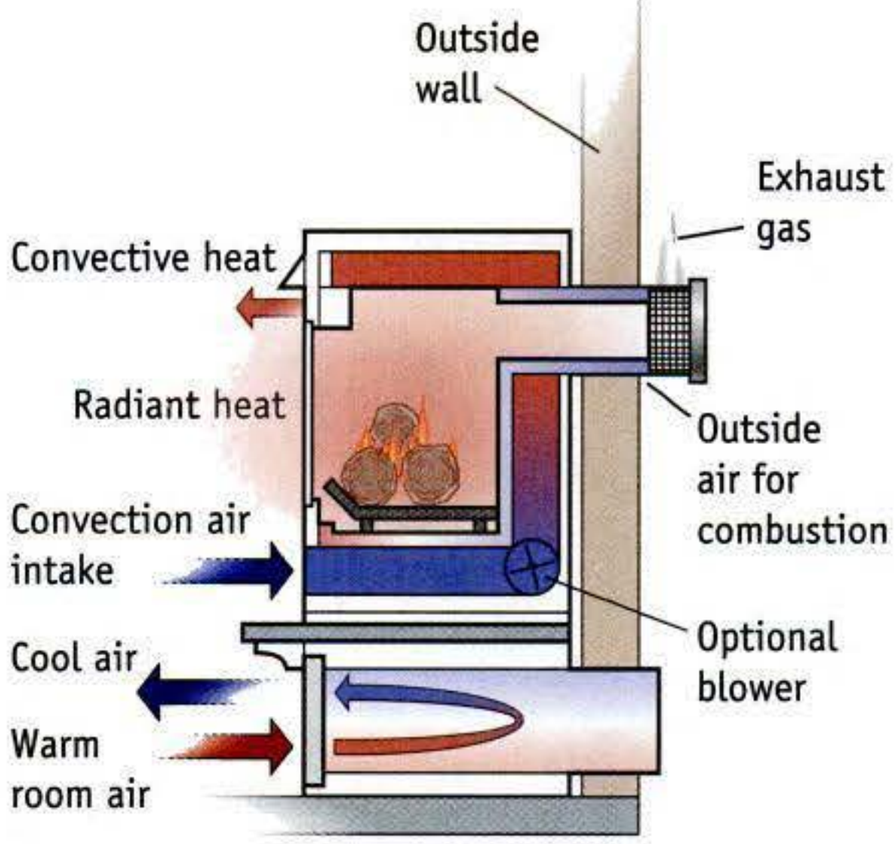


A Real TKO

AEROBIC BOXING comes home with Sparring Partner, a computerized punching/martial arts bag. Among the programmable features are number of rounds (1 to 16), length of rounds (up to four minutes each), and length of between-round rest periods (up to one minute). Sparring Partner tells how many calories have been burned, the number of punches thrown, and the power of the punches. Price: about $300. Technical Knockout, Box 0035, Ellicott Station, Buffalo NY 14205.

Kitchen Helper

IT'S SMALLER THAN a bread box, but Kitchen Assistant may prove equally handy around mealtimes. Developed by Design Edge of Austin, Texas, the countertop computer comes with paper-tape printer and two ROM card slots for storing and printing recipes, nutrition information, and a glossary of terms and ingredients. It can also suggest recipes for specific ingredients. Price: about $350. Brother International, 200 Cotton Tail Lane, Somerset NJ 08875.



Climate Control

IT LOOKS LIKE A fireplace, but look again: You can heat *or cool* a room with the Heat-N-Cool, a fireplace and air conditioner in one unit. The fireplace is a vented wall furnace; the air conditioner is suitable for a room up to 300 square feet. Price: about $3,600. Heat-N-Glo Fireplace Products, 6665 W. Highway 13, Savage MN 55378.

GREG MAXSON

Mini Minivan

SCALED FOR THE NARROW streets of Japan and Europe, the Toyota Ipsum (sold as the Picnic in Europe) has a wheelbase of 107 inches and is just 67 inches wide—making it one of the world's smallest minivans. Toyota won't offer the 2.0-liter Ipsum in North America.

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Now you can shoot off-center subjects like a pro with no need to focus, lock and recompose. So when an unexpected moment occurs while you're shooting, even if it's off-center, you have the technology to capture it.

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EOS ELAN IIE

Canon

So advanced...it's simple.

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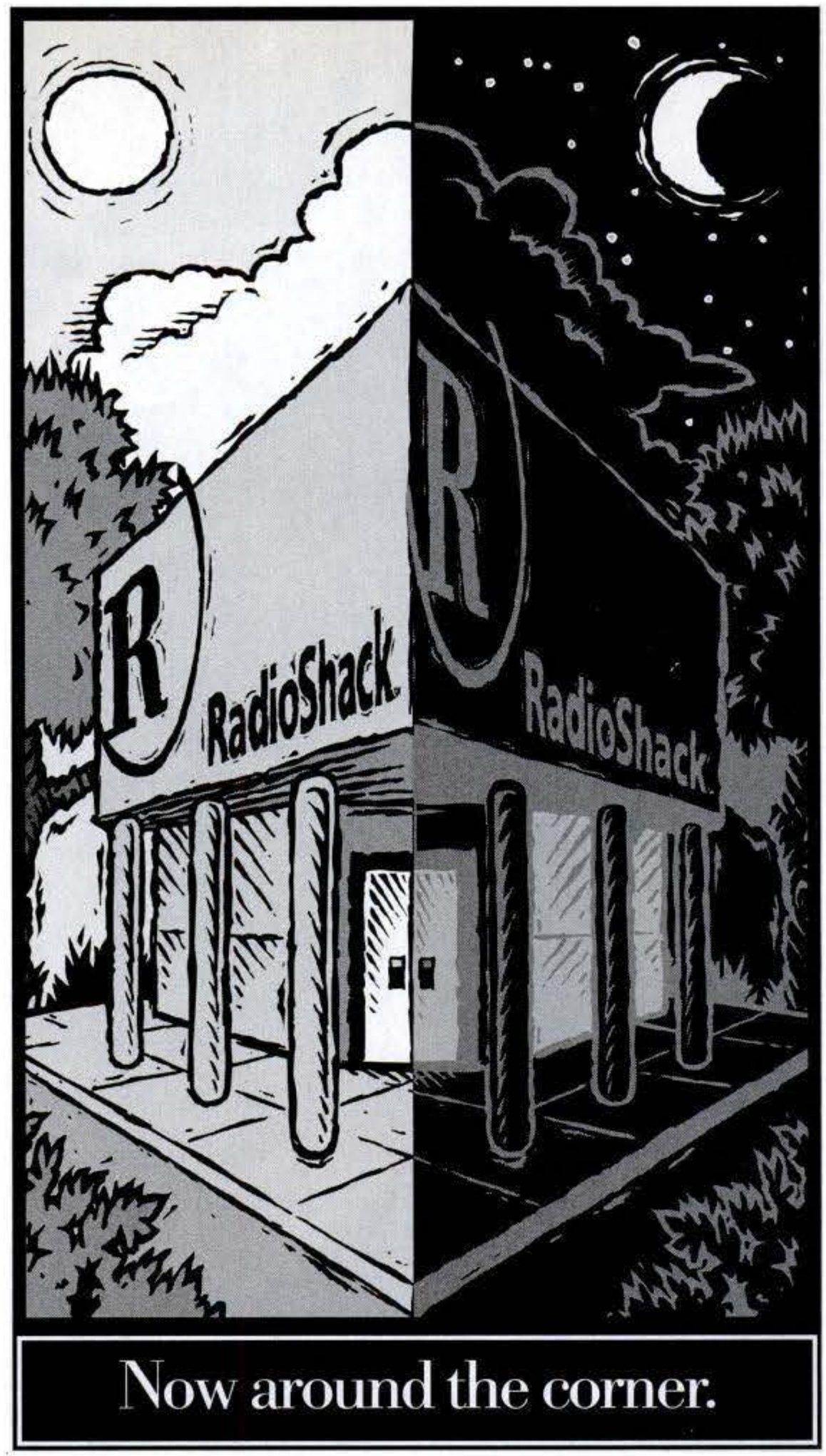

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ADT AND RADIOSHACK. TAKING THE INSECURITY OUT OF HOME SECURITY.℠

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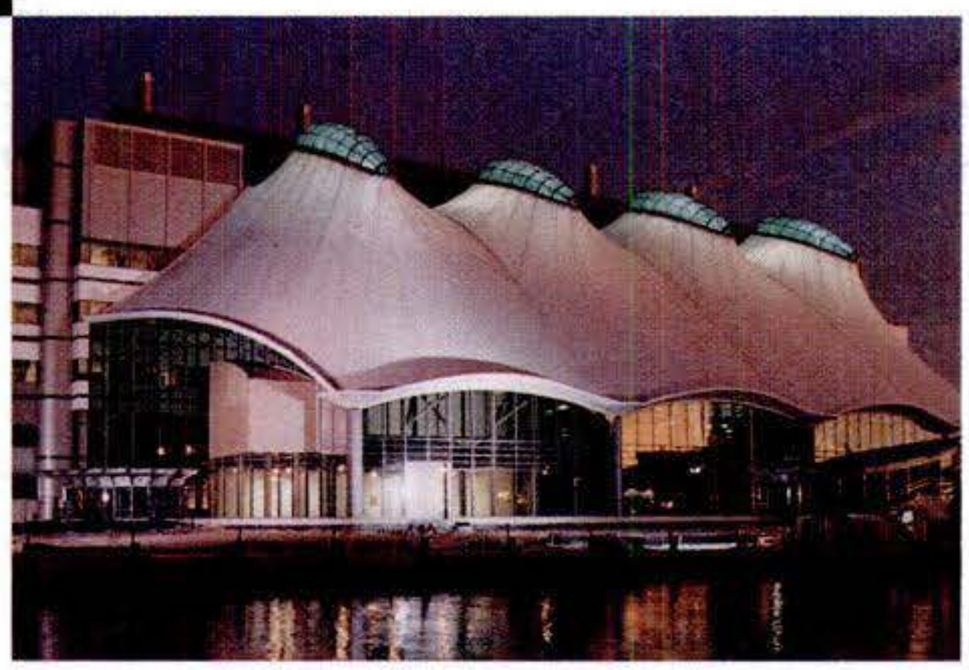
Nighttime Showtime

SHOOT HOOPS RIGHT through the twilight with Night Hoop, a flexible electric light that attaches around the bottom of any basketball rim. Night Hoop produces 27 watts of light and is enclosed in durable polyurethane casing. The lighting unit is reported to last for 10,000 hours. Price: about $30. Night Hoop, 149 Church St., Toronto, Ontario, Canada M5B 1Y4.

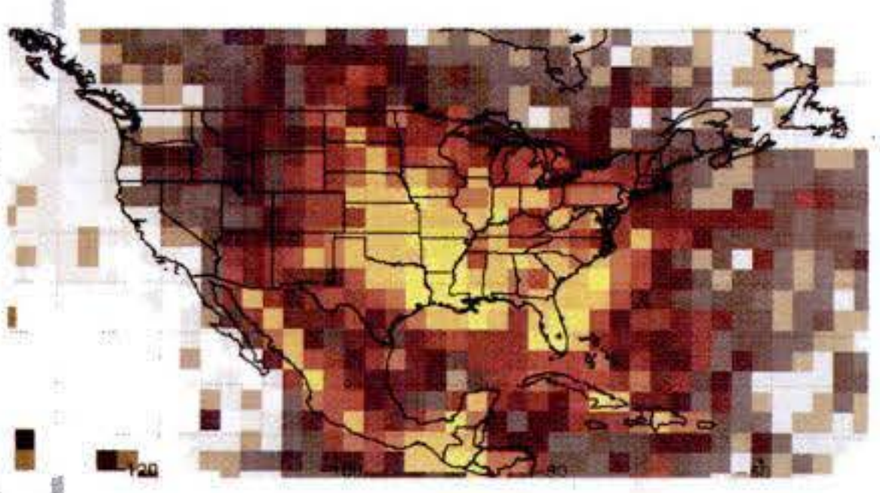
Off-hand Remarks

DICK TRACY HAD ONLY a two-way wrist radio. Engineers at Nippon Telegraph and Telephone Corp., Japan's largest phone company, have packed a cellular phone plus a wristwatch into one wearable device. The prototype weighs 2.5 ounces. Voice recognition eliminates any need for dialing buttons. The company expects to develop a commercial product within two years.



Center Ahoy!

THE LATEST VESSEL to "sail" into Baltimore's Inner Harbor is the $160 million Columbus Center for marine biotechnology, opening to the public in December. With a design evoking a sailing ship—including a fabric roof held aloft by "masts"—the facility combines exhibits, an education center, and research laboratories. UMBI Center of Marine Biotechnology, 111 Market Pl., Baltimore MD 21202.

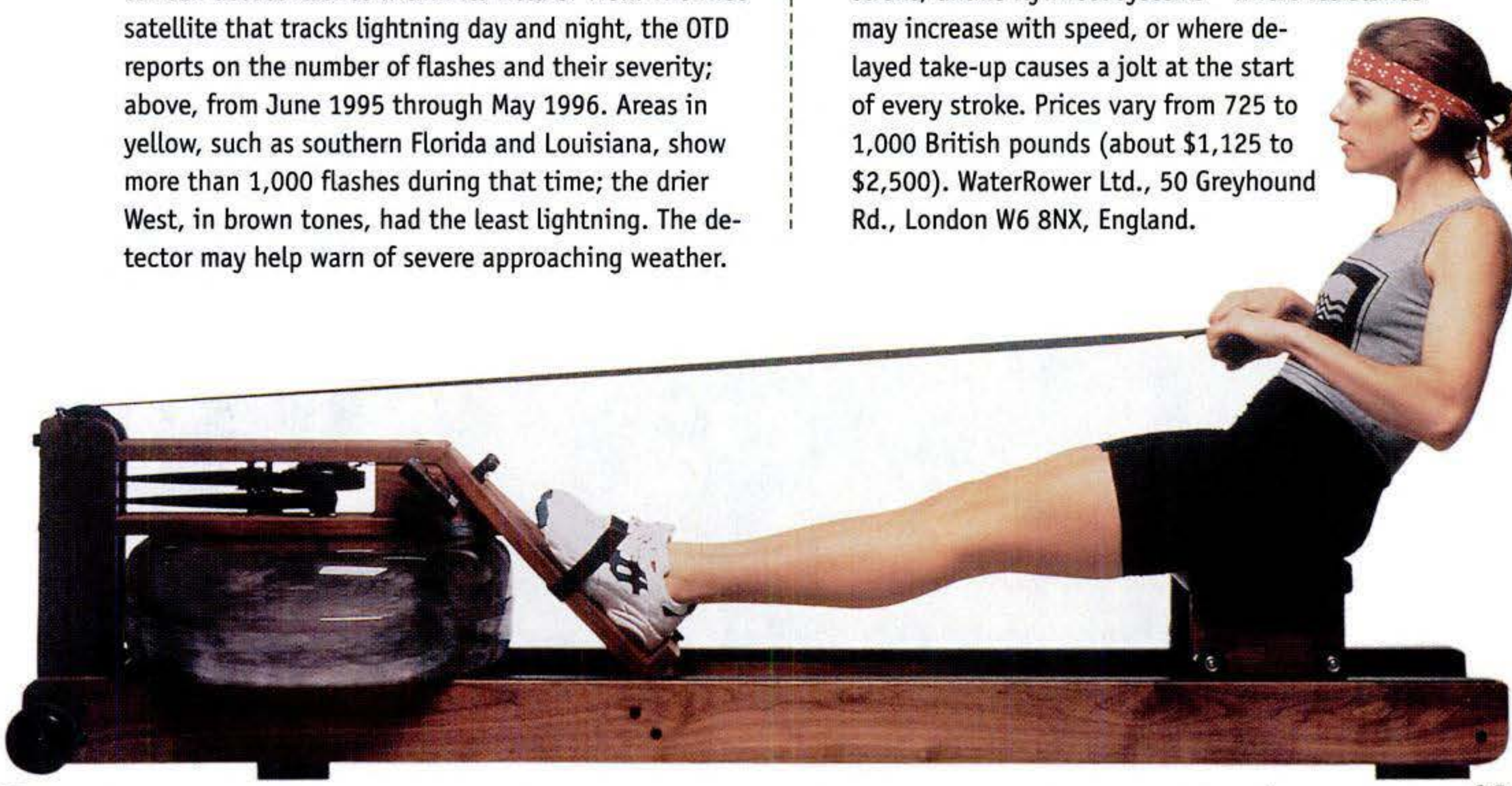


Stormy Record

IT CAN'T catch lightning in a bottle, but NASA's Optical Transient Detector can detect flashes within its field of view. The first satellite that tracks lightning day and night, the OTD reports on the number of flashes and their severity; above, from June 1995 through May 1996. Areas in yellow, such as southern Florida and Louisiana, show more than 1,000 flashes during that time; the drier West, in brown tones, had the least lightning. The detector may help warn of severe approaching weather.

Row, Row, Row Yourself

YOU CAN TEST YOUR MUSCLES on an ordinary rowing machine, but why not one with water? For a more realistic simulation, the WaterRower uses H_2O for resistance. Designed by a U.S. Olympic oarsman, WaterRower spreads the load evenly over the full stroke, unlike flywheel systems—where resistance may increase with speed, or where delayed take-up causes a jolt at the start of every stroke. Prices vary from 725 to 1,000 British pounds (about $1,125 to $2,500). WaterRower Ltd., 50 Greyhound Rd., London W6 8NX, England.



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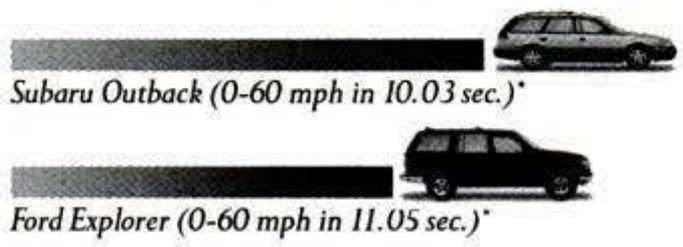
Over the past year, the Subaru Outback® has taken on some of the biggest names in the automotive industry. And to the surprise of many, The World's First Sport-utility Wagon™ has proven a worthy competitor for the world's leading sport-utility vehicles, besting the Blazer on turning stability and conquering the Grand Cherokee on gas mileage. So this time, we set our sights on a brand-new challenge: beating the Ford Explorer and its standard V6 on zero-to-sixty acceleration. Now at first glance, our 2.5-liter boxer engine may have appeared to be no match for such a formidable opponent. But thanks to the added traction of full-time Subaru All-Wheel Drive, the feisty Outback made quick work of America's number one sport-utility vehicle, finishing a full second ahead of its fiercest competitor.



IN A RECENT TEST OF ACCELERATION, THE GAS PEDAL WASN'T THE ONLY THING WE FLOORED.

COMPARE THE SUBARU OUTBACK*

	Subaru Outback	Ford Explorer XLT	Chevrolet Blazer LS	Jeep Grand Cherokee
EPA Fuel Economy (city/highway est.)	21 27	15/20	16/22	15/20
Ground Clearance (in.)	7.3	6.7	8.3	7.8
Front Legroom/ Headroom (in.)	40.2/43.3	39.9/42.4	39.5/42.4	37.8/41.4
Pricing	$23,790	$27,380	$26,373	$27,840

Of course, speed isn't the only reason the Subaru Outback is off to such a fast start with car buyers. Its unique hybrid design combines the smooth ride and fuel economy of a passenger sedan with the rugged capabilities of a sport-utility, for a driving adventure like no other. There's also the added security of the Subaru All-Wheel Driving System, which allows the Outback to constantly monitor changing road conditions and transfer power from the wheels that slip to the wheels that grip. You'll find plenty of other safety features, too. Including four-channel ABS, side-impact beams, crumple zones and standard dual air bags.†

So see your Subaru dealer for a test-drive, visit our website at http://www.subaru.com or make a quick call to our toll-free number: 1-800-WANT-AWD. But you'd better step on it. Because these babies really are going fast.

The New 1997 OUTBACK®

SUBARU®
The Beauty of All-Wheel Drive.®

*Competitive comparisons based on '96 model year. Outback figures based on '97 model year. Ground clearance comparison based on manufacturer's published specs. Pricing based on '97 MSRP Subaru Outback 4EAT and '96 MSRP for comparably equipped competitive vehicles, not including inland transportation, taxes, license and title fees. Dealer's actual price may vary. Turning stability claim vs. Blazer based on USAC-certified dry lateral acceleration test. 0-60 mph acceleration vs. Explorer with standard V6 engine based on USAC-certified testing. †Always wear seat belts.

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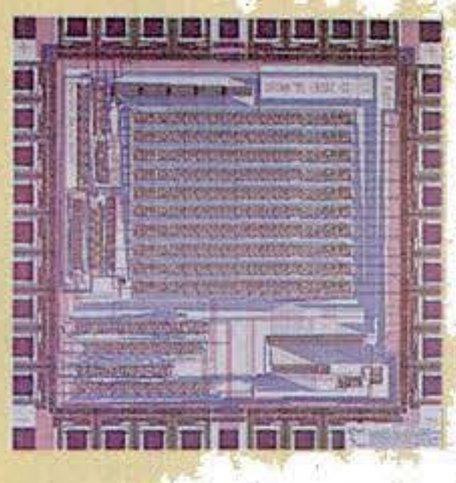
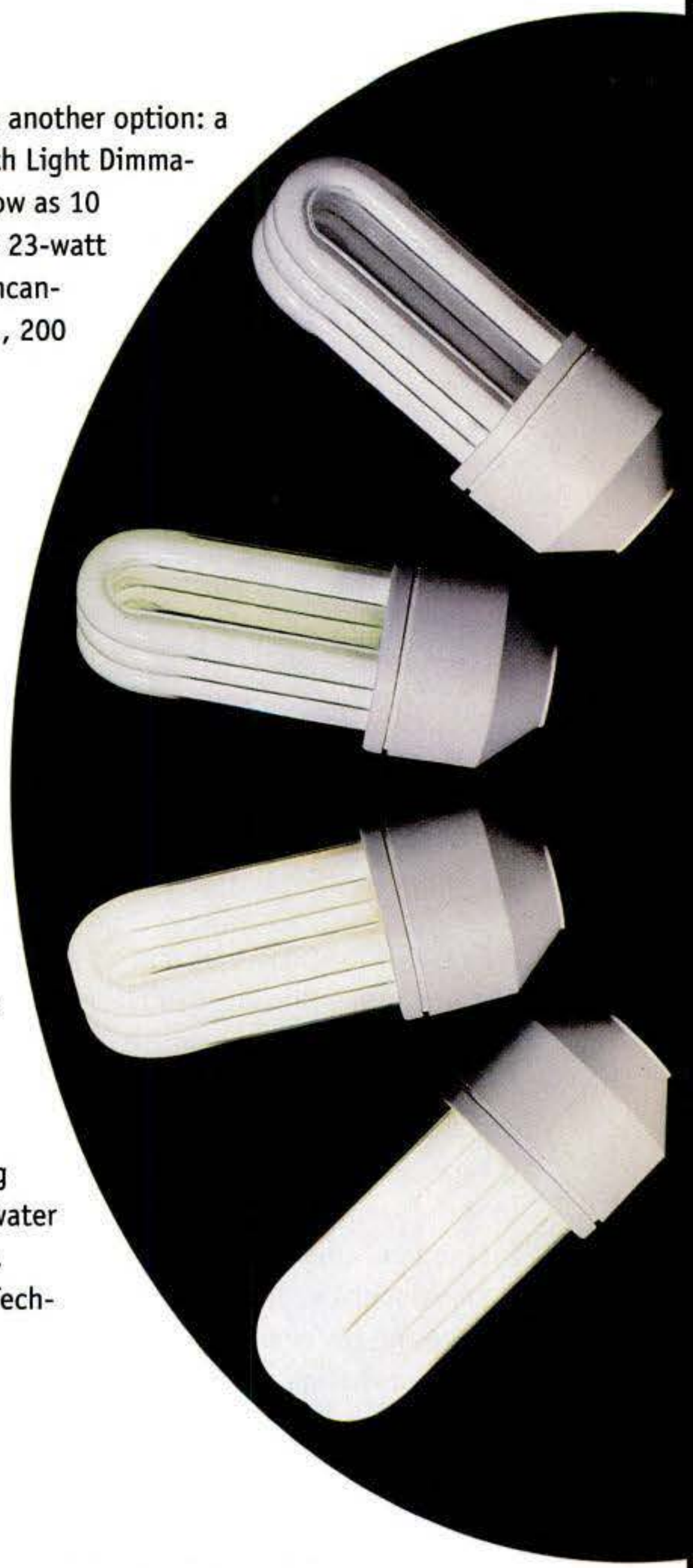


ENIAC Meets Silicon

THE FAMOUS ENIAC computer, built 50 years ago, was a 30-ton behemoth measuring 80 feet by 30 feet, and had 18,000 vacuum tubes and 170,000 resistors. Now, students and faculty at the University of Pennsylvania have put all the computing capabilities of ENIAC onto a single chip that measures eight millimeters square, to show that computers have indeed come a long way, baby. A kit for-sale of ENIAC-on-a-Chip, a printed circuit board, and PC software is planned. University of Pennsylvania, Department of Electrical Engineering, Philadelphia PA 19104.

Dim Bulb Shines

LATE NEXT YEAR, users of fluorescent lamps will have another option: a dimmable screw-based compact fluorescent. The Earth Light Dimmable lamp will use standard dimmers for dimming as low as 10 percent of original brightness. At full brightness, the 23-watt fluorescent has the equivalent output of a 90-watt incandescent. The price is not yet set. Philips Lighting Co., 200 Franklin Square Dr., Somerset NJ 08875.



Versatile Vest

EXOTHERMAL Technology introduces a versatile work vest for variable conditions. Plastic packets with a Heat Transfer Formula are contoured to sit against your body to keep out the chill or to beat the heat. Warm packets are refreshed in the recharging unit; cold packets can go in ice water or in a recharger. The price, with either hot or cold pockets, ranges from $199 to $300, depending on size. Exothermal Technology, 1720 Main St. NE, Palm Bay FL 32905.

Going Aero

SAAB TAPPED ITS AIRCRAFT heritage for aerodynamic concept versions of the Saab 900 convertible (pictured) and coupe, planned for production in late 1997. Performance-enhancing components include spoilers, a rear wing, and 17-inch light-alloy wheels. Engine power for the 2.5-liter V6 is enhanced to 250 hp, with suspension, brakes, and other chassis components beefed up to match. Saab Cars USA Inc., 4405-A Saab Dr., Box 9000, Norcross GA 30091.

Definitive ID

NO MORE FORGETTING PIN numbers or losing ID cards: Your face can be your ticket to entry. The TrueFace System recognizes faces that are authorized access to buildings or secure areas. Software in a neural network distinguishes facial patterns, even with hairdo changes. The system, which costs around $3,500, has been installed at some 70 sites around the country. Miros, 572 Washington St., No. 18, Wellesley MA 02181.

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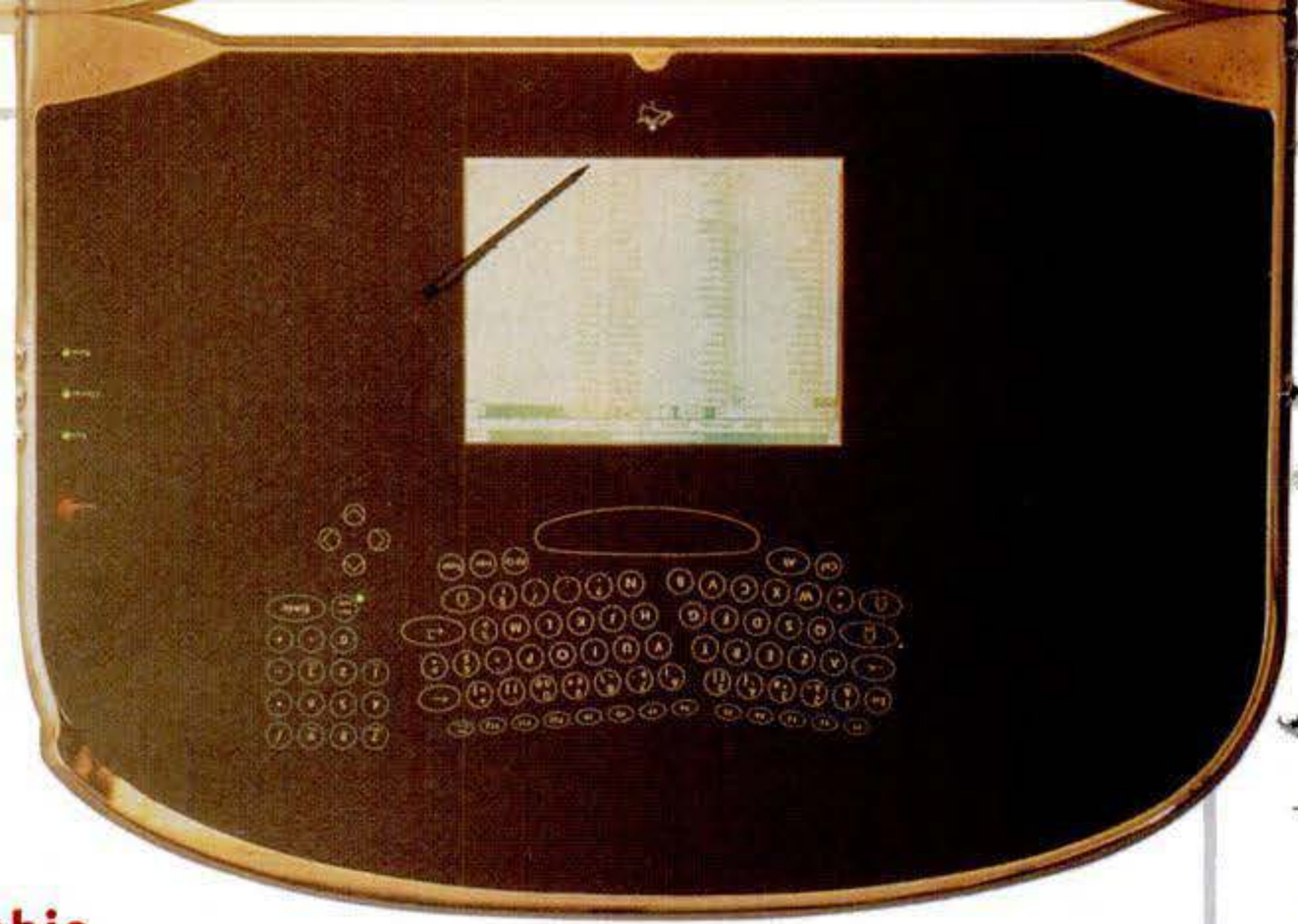


Skinny Deskpad

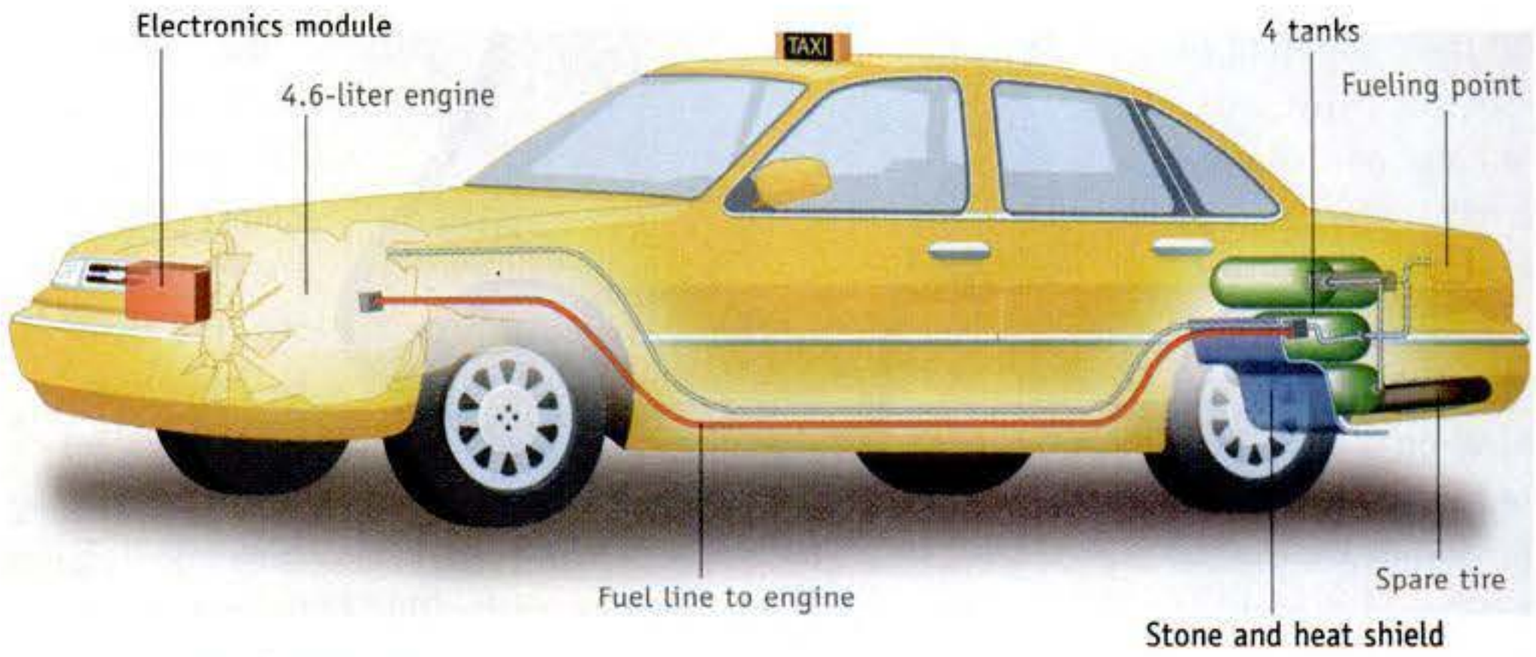
IT LOOKS LIKE PART of a desk, but the ultrathin Modula-Executive is actually a deskpad that replaces the keyboard, mouse, microphone, speakers, and monitor. It measures 20 by 29 by 0.5 inches and is activated by an electric pen or the touch of a finger. Price: about $2,880. Source Developpement, 9-11, Grande Allee du 12 Fevrier 1934, 77186 Noisiel, France.

Stovetop Fireman

AS A COOKING FIRE erupts on your stove top, the Guardian III sprays into action, extinguishing the flames and sending a signal that sonically activates the gas or electricity shut-off to the stove. The system is the first to run without hardwiring. It comes with one 9-volt DC battery and can connect to security systems and automatic phone dialers. Price: about $650. Twenty First Century International Fire Equipment and Services Corp., 3249 W. Story Rd., Irving TX 75038.

Clean Cabbie

NEW YORK CITY TAXIS will be cleaner—or at least burn fuel that way—as the fleet converts to compressed natural gas, which produces one-tenth the emissions of gasoline. By year's end, 40 of the city's 11,920 cabs may run on the fuel. One potential downside: finding one of the 20 local filling stations. Conversion isn't cheap either: from $4,500 to $6,000, but state and federal governments are footing the bill.



ANDY CHRISTIE

Looking for Lightning

AS MANY AS 400 people die annually from lightning strikes. The handheld SkyScan Lightning Detector uses software designed to do a better job than other portable detectors of differentiating lightning flashes from mere static. SkyScan combines an audio alarm with warning lights that can be set for ranges from three to 40 miles. Price: about $200. U.S. Cavalry, 2855 Centennial Ave., Radcliff KY 40160-9000.

A Really Advanced Photo System

CANON'S EOS IX IS ONE of the few cameras introduced so far to take full advantage of the Advanced Photo System [June]. Sleekly elegant in a stainless steel finish, this SLR records vital data from the scene being photographed and transmits it to the printer for enhanced print quality. It also allows mid-roll film change, not available on simpler APS models. And it's compatible with the full line of Canon's EF interchangeable lenses. The price is not yet set.

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INTRODUCING PRESCRIPTION SPORANOX, THE NEW TREATMENT THAT COULD...

KICK TOENAIL FUNGUS.

TOENAIL WITH FUNGUS.

IF YOU THINK YOU HAVE TOENAIL FUNGUS, ASK YOUR DOCTOR OR CALL 1-800-595-NAILS.

Take **SPORANOX** treatment orally for just 3 months and you may see a visible difference.

Soon after you stop taking SPORANOX, you may notice that the new nail growing in appears normal. Since nails need time to grow, you should expect it to be several months before healthy, new nails grow in.

So, now you can give thick, yellowing, brittle nails the boot and start growing fresh, new nails!

Ask your doctor or other healthcare professional about prescribing SPORANOX today. For more information, call

1-800-595-NAILS ext. 225

What you should know about the safety of SPORANOX: SPORANOX has been well tolerated in patients. In clinical trials involving patients with thick, hard, yellowish, and/or brittle nails (onychomycosis), the following adverse effects led to either a temporary or a permanent discontinuation of treatment: elevated liver enzymes (4%), gastrointestinal disorders (4%), and rash (3%).

WARNING: SPORANOX must not be taken with terfenadine (Seldane®), astemizole (Hismanal®), cisapride (Propulsid®), or oral triazolam (Halcion®).

In rare instances, there were reports of elevated liver enzymes and hepatitis. (If clinical signs and symptoms consistent with liver disease develop, SPORANOX should be discontinued.) If you're pregnant or considering pregnancy, you should not take SPORANOX. Take SPORANOX only as directed by your doctor, and report any adverse effects to your doctor as soon as possible.

world leader in antifungal research

JANSSEN PHARMACEUTICA RESEARCH FOUNDATION

Titusville, NJ 08560-0200

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JPI-SP-104-1 March 1996 Printed in U.S.A.

NOW 100 mg

sporanox®

(itraconazole capsules)

PLEASE SEE IMPORTANT PRECAUTIONARY INFORMATION ON ADJACENT PAGE.

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100 mg

sporanox®

(itraconazole capsules)

Before prescribing, please consult complete prescribing information of which the following is a brief summary.

WARNING: Coadministration of terfenadine with itraconazole is contraindicated. Serious cardiovascular adverse events, including death, ventricular tachycardia, and torsades de pointes have occurred in patients taking itraconazole concomitantly with terfenadine. This is due to elevated terfenadine concentrations caused by itraconazole. See CONTRAINDICATIONS, WARNINGS, and PRECAUTIONS sections.

Another oral azole antifungal, ketoconazole, inhibits the metabolism of astemizole, resulting in elevated plasma concentrations of astemizole and its active metabolite desmethylastemizole, which may prolong QT intervals. Based on results of an *in vitro* study and the chemical resemblance of itraconazole and ketoconazole, coadministration of astemizole and itraconazole is contraindicated. See CONTRAINDICATIONS, WARNINGS, and PRECAUTIONS sections.

Coadministration of cisapride with itraconazole is contraindicated. Serious cardiovascular adverse events including death, ventricular tachycardia, and torsades de pointes have occurred in patients taking itraconazole concomitantly with cisapride. See CONTRAINDICATIONS, WARNINGS, and PRECAUTIONS sections.

INDICATIONS AND USAGE

SPORANOX (itraconazole capsules) is indicated for the treatment of the following fungal infections in immunocompromised and non-immunocompromised patients:

1. Blastomycosis, pulmonary and extrapulmonary;
2. Histoplasmosis, including chronic cavitary pulmonary disease and disseminated, non-meningeal histoplasmosis;
3. Aspergillosis, pulmonary and extrapulmonary, in patients who are intolerant of or who are refractory to amphotericin B therapy; and
4. Onychomycosis due to dermatophytes (tinea unguium) of the toenail with or without fingernail involvement.

CONTRAINDICATIONS

Coadministration of terfenadine, astemizole or cisapride with SPORANOX (itraconazole capsules) is contraindicated. (See BOX WARNING, WARNINGS, and PRECAUTIONS sections.)

Concomitant administration of SPORANOX with oral triazolam or with oral midazolam is contraindicated. (See PRECAUTIONS section.)

SPORANOX should not be administered for the treatment of onychomycosis to pregnant patients or to women contemplating pregnancy.

SPORANOX is contraindicated in patients who have shown hypersensitivity to the drug or its excipients. There is no information regarding cross hypersensitivity between itraconazole and other azole antifungal agents. Caution should be used in prescribing SPORANOX to patients with hypersensitivity to other azoles.

WARNINGS

In U.S. clinical trials prior to marketing, there have been three cases of reversible idiosyncratic hepatitis reported among more than 2500 patients taking SPORANOX (itraconazole capsules). One patient outside the U.S. developed fulminant hepatitis and died during SPORANOX administration. Since this patient was on multiple medications, the causal association with SPORANOX is uncertain. If clinical signs and symptoms consistent with liver disease develop that may be attributable to itraconazole, SPORANOX should be discontinued.

Prior to U.S. marketing, there have been three cases of life-threatening cardiac dysrhythmias and one death reported in patients receiving terfenadine and itraconazole. (See BOX WARNING, CONTRAINDICATIONS, and PRECAUTIONS sections.)

Coadministration of astemizole with SPORANOX is contraindicated. (See BOX WARNING, CONTRAINDICATIONS, and PRECAUTIONS sections.)

Concomitant administration of oral ketoconazole with cisapride has resulted in markedly elevated cisapride plasma concentrations, prolonged QT intervals, and has rarely been associated with ventricular arrhythmias and torsades de pointes. Due to potent *in vitro* inhibition of the hepatic enzyme system mainly responsible for the metabolism of cisapride (cytochrome P450 3A4), itraconazole is also expected to markedly raise cisapride plasma concentrations; therefore, concomitant use of cisapride with SPORANOX is contraindicated. (See BOX WARNING, CONTRAINDICATIONS, and PRECAUTIONS sections.)

PRECAUTIONS

General: Hepatic enzyme test values should be monitored in patients with preexisting hepatic function abnormalities. Hepatic enzyme test values should be monitored periodically in all patients receiving continuous treatment for more than one month or at any time a patient develops signs or symptoms suggestive of liver dysfunction.

SPORANOX (itraconazole capsules) should be administered after a full meal.

Under fasted conditions, itraconazole absorption was decreased in the presence of decreased gastric acidity. The absorption of itraconazole may be decreased with the concomitant administration of antacids or gastric acid secretion suppressors. Studies conducted under fasted conditions demonstrated that administration with 8 ounces of a cola beverage resulted in increased absorption of itraconazole in AIDS patients with relative or absolute achlorhydria. This increase relative to the effects of a full meal is unknown.

Information for patients: Patients should be instructed to take SPORANOX with a full meal.

Patients should be instructed to report any signs and symptoms that may suggest liver dysfunction so that the appropriate laboratory testing can be done. Such signs and symptoms may include unusual fatigue, anorexia, nausea and/or vomiting, jaundice, dark urine or pale stool.

Drug interactions: Both itraconazole and its major metabolite, hydroxyitraconazole, are inhibitors of the cytochrome P450 3A4 enzyme system. Coadministration of SPORANOX and drugs primarily metabolized by the cytochrome P450 3A4 enzyme system may result in increased plasma concentrations of the drugs that could increase or prolong both therapeutic and adverse effects. Therefore, unless otherwise specified, appropriate dosage adjustments may be necessary.

Coadministration of terfenadine with SPORANOX has led to elevated plasma concentrations of terfenadine, resulting in rare instances of life-threatening cardiac dysrhythmias and one death. (See BOX WARNING, CONTRAINDICATIONS, and WARNINGS sections.)

Another oral azole antifungal, ketoconazole, inhibits the metabolism of astemizole, resulting in elevated plasma concentrations of astemizole and its active metabolite desmethylastemizole which may prolong QT intervals. *In vitro* data suggest that itraconazole, when compared to ketoconazole, has a less pronounced effect on the biotransformation system responsible for the metabolism of astemizole. Based on the chemical resemblance of itraconazole and ketoconazole, coadministration of astemizole with itraconazole is contraindicated. (See BOX WARNING, CONTRAINDICATIONS, and WARNINGS sections.)

Human pharmacokinetics data indicate that oral ketoconazole potently inhibits the metabolism of cisapride resulting in an eight-fold increase in the mean AUC of cisapride. Data suggest that coadministration of oral ketoconazole and cisapride can result in prolongation of the QT interval on the ECG. *In vitro* data suggest that itraconazole also markedly inhibits the biotransformation system mainly responsible for the metabolism of cisapride; therefore concomitant administration of SPORANOX with cisapride is contraindicated. (See BOX WARNING, CONTRAINDICATIONS, and WARNINGS sections.)

Coadministration of SPORANOX with oral midazolam or triazolam has resulted in elevated plasma concentrations of the latter two drugs. This may potentiate and prolong hypnotic and sedative effects. These agents should not be used in patients treated with SPORANOX. If midazolam is administered parenterally, special precaution is required since the sedative effect may be prolonged. (See CONTRAINDICATIONS section.)

Coadministration of SPORANOX and cyclosporine, tacrolimus or digoxin has led to increased plasma concentrations of the latter three drugs. Cyclosporine, tacrolimus and digoxin concentrations should be monitored at the initiation of SPORANOX therapy and frequently thereafter, and the dose of these three drug products adjusted appropriately.

There have been rare reports of rhabdomyolysis involving renal transplant patients receiving the combination of SPORANOX, cyclosporine, and the HMG-CoA reductase inhibitors lovastatin or simvastatin. Rhabdomyolysis has been observed in patients receiving HMG-CoA reductase inhibitors administered alone (at recommended dosages) or concomitantly with immunosuppressive drugs including cyclosporine.

When SPORANOX was coadministered with phenytoin, rifampin, or H_2 antagonists, reduced plasma concentrations of itraconazole were reported. The physician is advised to monitor the plasma concentrations of itraconazole when any of these drugs is taken concurrently, and to increase the dose of SPORANOX if necessary. Although no studies have been conducted, concomitant administration of SPORANOX and phenytoin may alter the metabolism of phenytoin; therefore, plasma concentrations of phenytoin should also be monitored when it is given concurrently with SPORANOX.

It has been reported that SPORANOX enhances the anticoagulant effect of coumarin-like drugs. Therefore, prothrombin time should be carefully monitored in patients receiving SPORANOX and coumarin-like drugs simultaneously.

Plasma concentrations of azole antifungal agents are reduced when given concurrently with isoniazid. Itraconazole plasma concentrations should be monitored when SPORANOX and isoniazid are coadministered.

Severe hypoglycemia has been reported in patients concomitantly receiving azole antifungal agents and oral hypoglycemic agents. Blood glucose concentrations should be carefully monitored when SPORANOX and oral hypoglycemic agents are coadministered.

Tinnitus and decreased hearing have been reported in patients concomitantly receiving SPORANOX and quinidine. Edema has been reported in patients concomitantly receiving SPORANOX and dihydropyridine calcium channel blockers. Appropriate dosage adjustments may be necessary.

The results from a study in which eight HIV-infected individuals were treated with zidovudine, 8±0.4 mg/kg/day, showed that the pharmacokinetics of zidovudine were not affected during concomitant administration of SPORANOX, 100 mg b.i.d.

Carcinogenesis, Mutagenesis and Impairment of Fertility: Itraconazole showed no evidence of carcinogenicity potential in mice treated orally for 23 months at dosage levels up to 80 mg/kg/day [approximately 10x the maximum recommended human dose (MRHD)]. Male rats treated with 25 mg/kg/day (3.1x MRHD) had a slightly increased incidence of soft tissue sarcoma. These sarcomas may have been a consequence of hypercholesterolemia, which is a response of rats, but not dogs or humans, to chronic itraconazole administration. Female rats treated with 50 mg/kg/day (6.25x MRHD) had an increased incidence of squamous cell carcinoma of the lung (2/50) as compared to the untreated group. Although the occurrence of squamous cell carcinoma in the lung is extremely uncommon in untreated rats, the increase in this study was not statistically significant.

Itraconazole produced no mutagenic effects when assayed in appropriate bacterial, non-mammalian and mammalian test systems.

Itraconazole did not affect the fertility of male or female rats treated orally with dosage levels of up to 40 mg/kg/day (5x MRHD) even though parental toxicity was present at this dosage level. More severe signs of parental toxicity, including death, were present in the next higher dosage level, 160 mg/kg/day (20x MRHD).

Pregnancy: Teratogenic Effects. Pregnancy Category C: Itraconazole was found to cause a dose-related increase in maternal toxicity, embryotoxicity and teratogenicity in rats at dosage levels of approximately 40-160 mg/kg/day (5-20x MRHD) and in mice at dosage levels of approximately 80 mg/kg/day (10x MRHD). In rats, the teratogenicity consisted of major skeletal defects; in mice it consisted of encephaloceles and/or macroglossia.

There are no studies in pregnant women. SPORANOX should be used for the treatment of systemic fungal infections in pregnancy only if the benefit outweighs the potential risk. SPORANOX should not be administered for the treatment of onychomycosis to pregnant patients or to women contemplating pregnancy. SPORANOX should not be administered to women of child-bearing potential for the treatment of onychomycosis unless they are taking effective measures to prevent pregnancy and the patient begins therapy on the second or third day of the next normal menstrual period. Effective contraception should be continued throughout SPORANOX therapy and for 2 months following treatment.

Nursing Mothers: Itraconazole is excreted in human milk; therefore, SPORANOX should not be administered to nursing women.

Pediatric Use: The efficacy and safety of SPORANOX have not been established in pediatric patients. No pharmacokinetic data are available in children. A small number of patients age 3 to 16 years have been treated with 100 mg/day of itraconazole for systemic fungal infections and no serious unexpected adverse effects have been reported.

In three toxicology studies using rats, itraconazole induced bone defects at dosage levels as low as 20 mg/kg/day (2.5x MRHD). The induced defects included reduced bone plate activity, thinning of the zona compacta of the large bones and increased bone fragility. At a dosage level of 80 mg/kg/day (10x MRHD) over one year or 160 mg/kg/day (20x MRHD) for six months, itraconazole induced small tooth pulp with hypocellular appearance in some rats.

While no such bone toxicity has been reported in adult patients, the long term effect of itraconazole in pediatric patients is unknown.

HIV-infected Patients: Because hypochlorhydria has been reported in HIV-infected individuals, the absorption of itraconazole in these patients may be decreased.

The results from a study in which eight HIV-infected individuals were treated with zidovudine, 8±0.4 mg/kg/day, showed that the pharmacokinetics of zidovudine were not affected during concomitant administration of SPORANOX, 100 mg b.i.d.

ADVERSE REACTIONS

In U.S. clinical trials prior to marketing, there have been three cases of reversible idiosyncratic hepatitis reported among more than 2500 patients. One patient outside the U.S. developed fulminant hepatitis and died during SPORANOX (itraconazole capsules) administration. Because this patient was on multiple medications, the causal association with SPORANOX is uncertain. (See WARNINGS section.)

ONYCHOMYCOSIS:
Adverse events in the following table led to either temporary or permanent discontinuation of treatment:

Body System/Adverse Event	Incidence (%) (n=112)
Elevated Liver Enzymes (>2x normal range)	4%
Gastrointestinal Disorders	4%
Rash	3%
Hypertension	2%
Orthostatic Hypotension	1%

Body System/Adverse Event	Incidence (%) (n=112)
Headache	1%
Malaise	1%
Myalgia	1%
Vasculitis	1%
Vertigo	1%

SYSTEMIC FUNGAL INFECTIONS:
Adverse experience data in the following table are derived from 602 patients treated for systemic fungal disease in U.S. clinical trials, who were immunocompromised or receiving multiple concomitant medications. Of these patients, treatment was discontinued in 10.5% of patients due to adverse events. The median duration before discontinuation of therapy was 81 days, with a range of 2-776 days. The table lists adverse events reported by at least 1% of patients.

Body System/Adverse Event (Incidence ≥ 1%)	Incidence (%)
Gastrointestinal Disorders	
Nausea	10.6
Vomiting	5.1
Diarrhea	3.3
Abdominal Pain	1.5
Anorexia	1.2
Body as a Whole	
Edema	3.5
Fatigue	2.8
Fever	2.5
Malaise	1.2
Skin and Appendages	
Rash	8.6*
Pruritus	2.5
Central and Peripheral Nervous System	
Headache	3.8
Dizziness	1.7

Body System/Adverse Event (Incidence ≥ 1%)	Incidence (%)
Psychiatric Disorders	
Libido decreased	1.2
Somnolence	1.2
Cardiovascular Disorders	
Hypertension	3.2
Metabolic and Nutritional Disorders	
Hypokalemia	2.0
Urinary System Disorders	
Albuminuria	1.2
Liver and Biliary System Disorders	
Hepatic function abnormal	2.7
Reproductive Disorders, Male	
Impotence	1.2

*Rash tends to occur more frequently in immunocompromised patients receiving immunosuppressive medications.

Adverse events infrequently reported in all studies included: constipation, gastritis, depression, insomnia, tinnitus, menstrual disorder, adrenal insufficiency, gynecomastia and male breast pain.

In worldwide postmarketing experience with SPORANOX, allergic reactions including rash, pruritus, urticaria, angioedema and in rare instances, anaphylaxis and Stevens-Johnson syndrome, have been reported. Marketing experiences have also included reports of elevated liver enzymes and rare hepatitis. Although the causal association with SPORANOX is uncertain, rare hypertriglyceridemia and isolated cases of neuropathy have also been reported.

OVERDOSAGE

Itraconazole is not removed by dialysis. In the event of accidental overdosage, supportive measures, including gastric lavage with sodium bicarbonate, should be employed.

No significant lethality was observed when itraconazole was administered orally to mice and rats at dosage levels of 320 mg/kg or to dogs at 200 mg/kg.

Rev. April 1995, September 1995

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NEWSFRONTS

COMPUTERS & SOFTWARE

EDITED BY CHRIS O'MALLEY

PORTABLE PCs

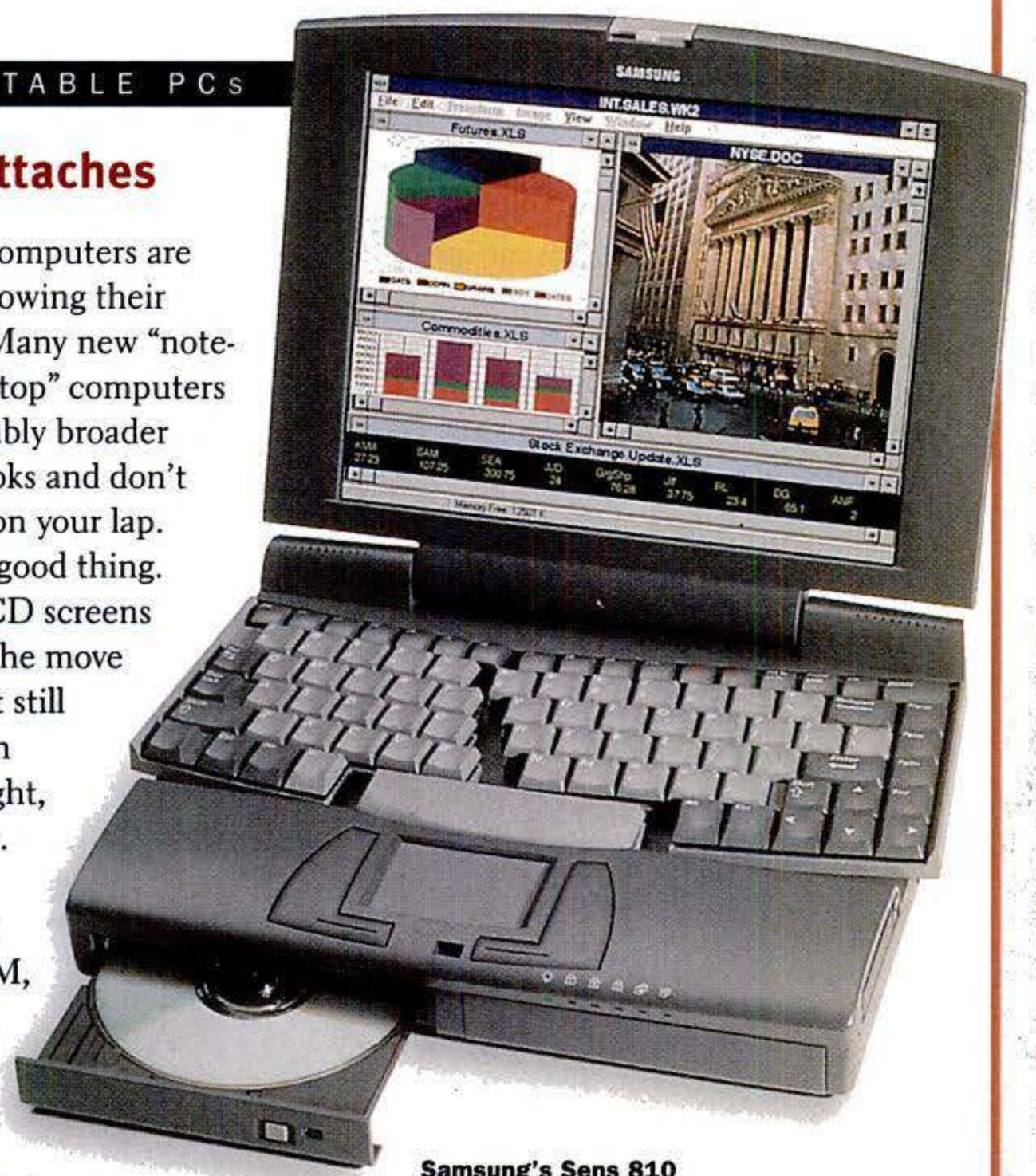
Digital Attaches

PORTABLE computers are rapidly outgrowing their metaphors. Many new "notebook" or "laptop" computers are considerably broader than notebooks and don't sit very well on your lap. And that's a good thing.

Larger LCD screens have forced the move to bigger, but still relatively thin and lightweight, portable PCs. The latest models from Compaq, IBM, NEC, Samsung, and Toshiba (among others) all sport flat displays that measure 12 inches or more diagonally. And LCD makers such as Sharp say even larger panels, in the 13- to 15-inch range, will soon be practical. Sharp, in fact, recently introduced a "wide-screen" portable with an LCD panel that mirrors the 16:9 aspect ratio of a movie-theater screen. These big, bright screens necessarily spell an end to the paper-size (8.5 by 11) form factor that has typified portable PCs for the last decade or so.

But bigger displays aren't the only culprits. The addition of multimedia gear such as CD-ROM drives and stereo speakers is also pushing the boundaries outward. And these expanding portables are not only easier on the eyes and ears, they're much kinder to the hands as well. Given the extra room, portable keyboards can more closely mimic their desktop counterparts. Samsung's new Sens 810 model even has an expanding keyboard like some of the latest ergonomic tappers.

Now all they need is a new metaphor. Attache PCs, perhaps?—C.O.



Samsung's Sens 810 is bursting at the seams with new features.

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—Suzanne Kantra Kirschner

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BEYOND HERE

Info Appliances

BY GINA SMITH

WITH so much talk of "Internet boxes," such as the so-called network computer, and of do-it-all PCs sprouting up in every home and classroom, it's easy to conjure up a vision of ubiquitous computer power and Internet access. But it's wishful thinking.

Everyone from software billionaires to schoolteachers has a reason for wanting to see tele-connected computers everywhere. But something major stands in the way. It isn't ease of use, as PC makers keep saying. And it isn't merely cost, as many would-be network-box makers suggest. The main problem is practicality. The one-size-fits-all mentality of PCs makes no more sense than a one-size-fits-all vehicle.

That's why a small voice from a tiny Northern California company called Diba is worth listening to. Founded by former executives of Oracle (one of the Internet-box believers), Diba's main focus is on building neither a single, multipurpose PC nor a single Internet terminal, nor even one of each. Rather, Diba is planning some 42—count them, 42—separate, single-purpose computers or information appliances.

In this age of digital convergence, it's an offbeat idea, to be certain, but Diba's Interactive Digital Electronic Appliances (IDEAs, for short) might be just the ticket. One, called Diba Mail, is a tiny e-mail/fax machine that's no larger than an answering machine. Another, called Diba Internet, is a VCR-like box with a remote control for Web surfing. Yet another, called Diba Kitchen, is an under-the-counter recipe box and ingredient calculator. There are other appliances for searching phone listings, paying bills, and the like.

Or *there will be*, I should say. None of these items are for sale yet, nor does Diba plan to sell them. The designer of these intriguing devices is in the software, not hardware, business. So Diba is shopping its designs (and software) to consumer electronics companies. But it says the target price for these machines will be between $150 and $300.

Now we're getting somewhere. The single-purpose design means these devices can be inexpensive and also easy to use. And, they are

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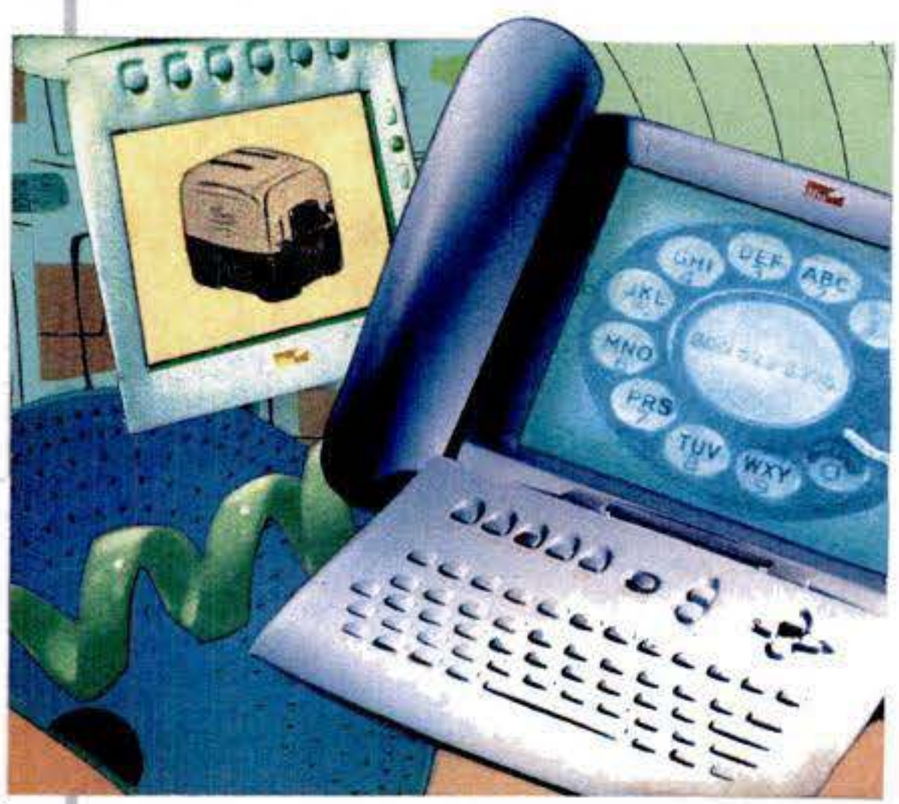

VICTORIA KAHN

practical. Personally, I could care less about a chef-centric computer in the kitchen, but I can bet that millions of you will love it—especially for $199. Ditto for an e-mail phone, or a portable Web browser, or an electronic bulletin board, or a full-color encyclopedia.

Yes, PCs with the right software mix can do all this, but so what? This way, you have choices. You would only buy the devices that made sense for what you want to do. Novel concept, eh? And as a bonus, a one-purpose device would likely have a decent lifespan of five years or more.

The point is not that IDEAs replace PCs. Rather, IDEAs offer an alternative to people who don't need or can't afford PCs.

And here's another dirty little secret: Dedicated devices work better than multifaceted ones. Specialization is the watchword of our society in all things except computing. If computer makers had designed our homes, no doubt we'd have a single machine heating our houses, warming our water, and drying our clothes. (It's all heat, right?) We'd throw our dishes and clothes—and maybe ourselves—in one machine to get clean. Sound absurd? If you're using a PC, you're operating on this principle right now.

Ultimately, whether or not Diba succeeds with these gadgets will depend on a number of mundane factors, such as signing up big-name manufacturers with big distribution channels in the right stores. That is not a trivial challenge.

But this is one IDEA whose time has come. Let's hope electronics makers see it as an opportunity, and not a threat to the status quo.

Gina Smith appears regularly on "Good Morning America," and nightly as host of The Discovery Channel's "Cyberlife." Send comments to PSLetters@aol.com.

8:05. Porch light on.**

8:40. Bedroom light on.

8:00. Kids' light on.

9:30. Radio on.

7:55. Aptiva turns itself on.

10:30. Driveway light on.**

t select retailers. **Additional hardware required.

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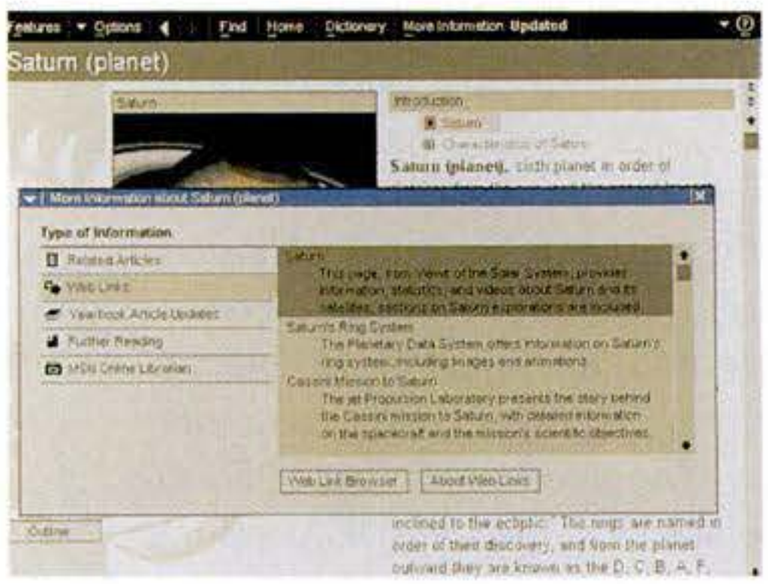
HANDS ON

Moving Knowledge

OK, SO I ADMIT I wasn't really up on the difference between the Great Schism (the break between Eastern and Western churches in 1054) and the Great Awakening (the general revival of evangelical religion in the American colonies). But in some ways, that is the beauty of Microsoft's Encarta 97 Deluxe: the ability to easily discover unexpected nuggets of knowledge.

Encarta 97's format and conventions resemble those of prior editions, which were already the gold standard for CD-ROM encyclopedias. Microsoft has retained the slick interface and the multiple ways to navigate through thousands of articles, photos, sound clips, and movies.



Online connections keep your encyclopedia fresh.

But now there are two different versions: Encarta 97 ($54.95, for Windows PCs), and the two-CD Encarta 97 Deluxe Edition ($79.95, for Windows and Mac systems). The extra CD of the latter is packed with more of just about everything: twice the number of images, 5,000 Web links (vs. 1,500 for the regular version), and more video clips and maps. Plus, it adds two new features not on the regular version: Collages and Panoramic Views. Collages are pre-set multimedia presentations on a variety of topics, from the Olympics to the history of photography. PanoramicViews put you in the center of a 360-degree photo with the ability to turn and look in any direction to give you a sense of what it's like to be in, say, New York's Times Square or the Coliseum in Rome.

Encarta 97's most valuable new feature may be its monthly updates, which are free to owners of the Deluxe version and available for an extra $20 to users of the regular version. (Updates can be downloaded from a Microsoft Web site.) Neither version guarantees Harvard for the kids or extra IQ points for you, but both are fun, fact-filled guides that should be on many CD-ROM bookshelves.—*Jon Pepper*

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ONLINE

The Local Angle

FOR ALL THE commotion over the Internet, the fact remains that the vast majority of Americans—even computer users—aren't connected. One possible reason: While there is an incredible amount of information out there, very little of it hits home. That's about to change, however.

Online services, existing and envisioned, are picking up the local angle. America Online is now in the process of rolling out its Digital City program. The idea is to provide a wide variety of localized news, services, and, yes, perhaps ads for cities across the country. That could mean reading the minutes of city council meetings, getting the scores of high school football games, glancing at community calendars, checking weather and traffic conditions in your area, perusing restaurant and school cafeteria menus, and thumbing though interactive classified ads. Atlanta, Boston, Philadelphia, San Francisco, and Washington are among the first cities in the Digital City program, and AOL says it plans to add more than 20 more in the coming months.

Digital City adds local flavor to the mix of national news on AOL.

They won't be alone. An experimental Internet service called CitySearch, backed by AT&T and others, plans to expand nationwide next year. Microsoft is planning a similar network, code-named CityScape, slated to begin service early next year. A number of other big media and communication companies are hatching local Web services too.

Whether or not you'll be asked to pay for any of this remains to be seen. But if it's free, expect to see local advertising too.—*C.O.*

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JUST ADD BACARDI

HOME TECHNOLOGY

EDITED BY JUDITH ANNE GUNTHER

LIGHTING

Dim and Dimmer

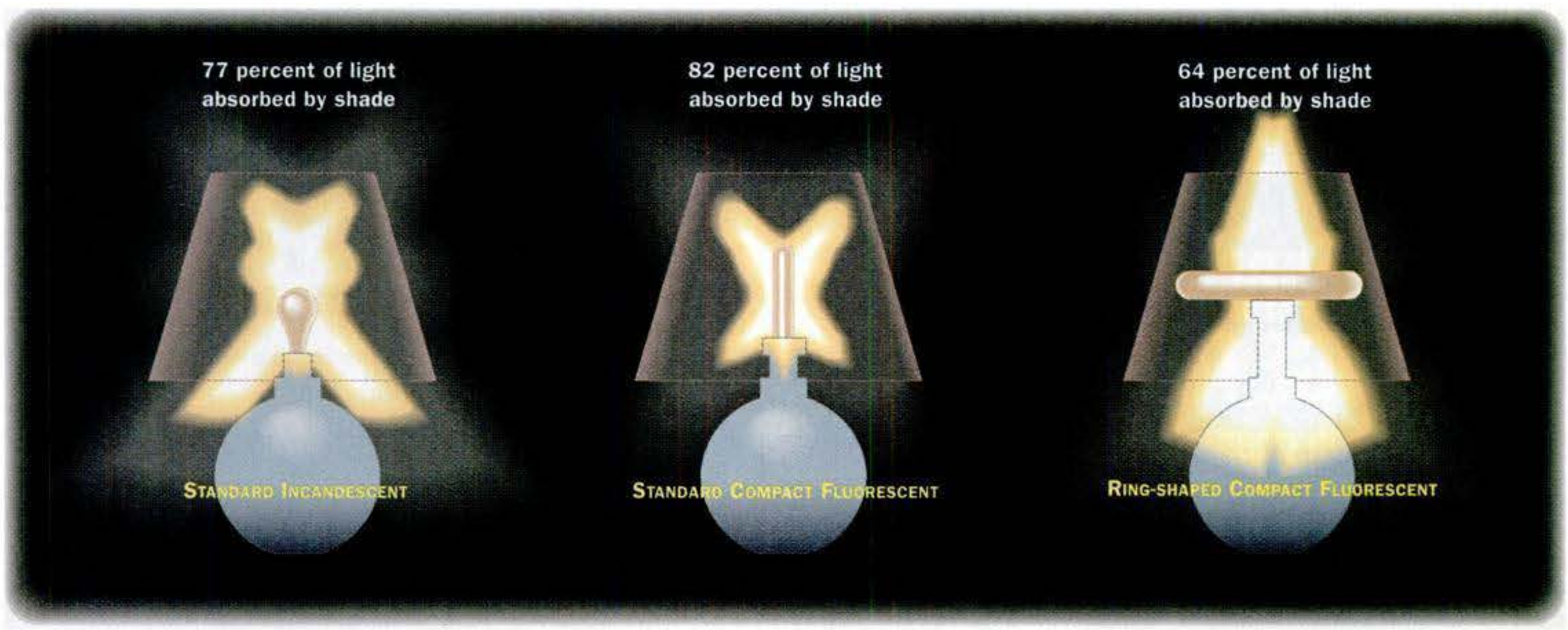
YOU KNEW YOU would cut your electric bills when you switched the 100-watt incandescent light bulb with an "equivalent" compact-fluorescent one. But it seems you've now cut the amount of light in the room too. Why?

The perceived brightness of any bulb is affected by the pattern in which it distributes its light, say scientists at Lawrence Berkeley National Laboratory in Berkeley, California. Recently, Erik Page and Michael Siminovitch developed a device called a goniophotometer to measure the amount of light emitted by different types of bulbs in a table lamp. This device positions a mirror at different angles to the lamp, from beneath the fixture to above it. At each position, the light bounces off the mirror to a light meter.

As it turns out, more than 77 percent of a standard incandescent bulb's light shines directly into the lamp shade, where much of it is absorbed. In comparison, a conventional triple-tube compact-fluorescent lamp directs more than 82 percent of its light into the shade. That's because the fluorescent tubes have straighter sides than the bulbous incandescent lamp. Ring-shaped compact-fluorescent lamps outperform the rest, however. Because this bulb's tube is positioned horizontally, it radiates only 64 percent of its light into the shade; the rest is sent downward, illuminating the table, or upward, providing more light to the room.

To get more light from compact fluorescents, consumers can switch to ring-shaped lamps. Also, the researchers are now working with a major table-lamp manufacturer to develop a dedicated fixture that helps standard, triple-tube compact-fluorescent lamps shine more efficiently. The new table lamp could be commercially available in 1997.—*J.A.G.*

ANDY CHRISTIE



WINDOWS

The Shade Electric

IMPROVEMENTS IN window film may make blinds obsolete, say researchers at Vrije University in the Netherlands. The scientists say they've developed a film that can block all, some, or none of the incoming light. This is a marked improvement over switchable window films on the market today. These films typically block no more than 70 percent of transmitted light.

Key to the new technology is the use of yttrium hydride, instead of the tungsten oxides of conventional switchable films. Unlike tungsten oxides, which are essentially insulators, yttrium hydrides are reflectors, because they are metallic. So they can allow no more light to pass through than does a mirror.

The system can be adjusted to make the window completely transparent, or to allow merely a portion of the outside light to enter. To accomplish that, researchers use a small battery to apply a voltage across the film. The voltage increases the number of hydrogen atoms, causing the film to change from a metal to a semiconductor. Result: The sun easily shines through it.

Scientists say that yttrium hydride films may still be several years from the market. The technology may also be useful in autos, sunglasses, and other applications.—*Chuck Murray*

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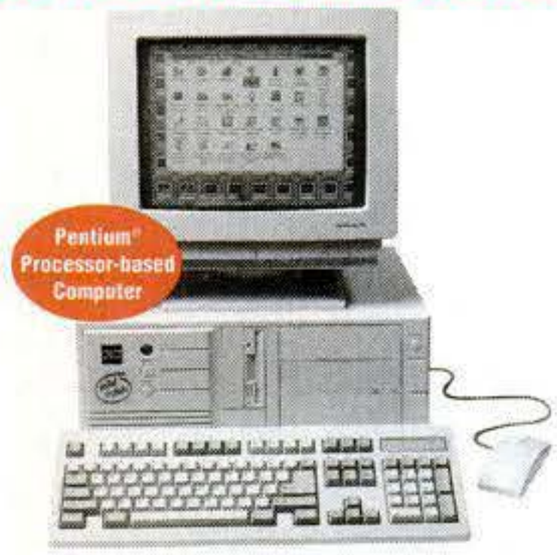

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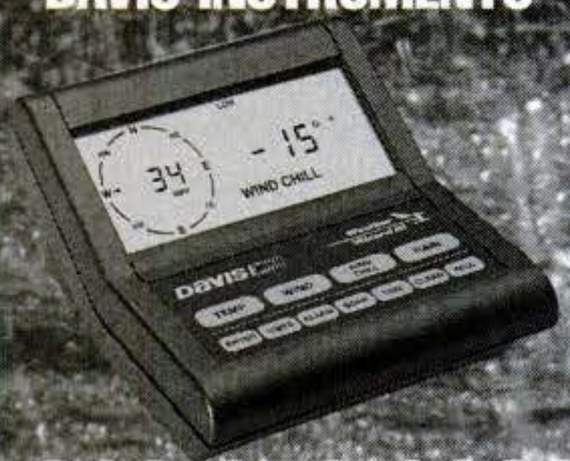

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HOT WATER SYSTEMS

"Stealing" Heat for Cheap Showers

DURING HOT weather, a house's heat pump takes heat from indoor air and dumps it outside, cooling the house. Now Lennox is introducing a relatively inexpensive way to use that excess heat for domestic hot water instead of throwing it away.

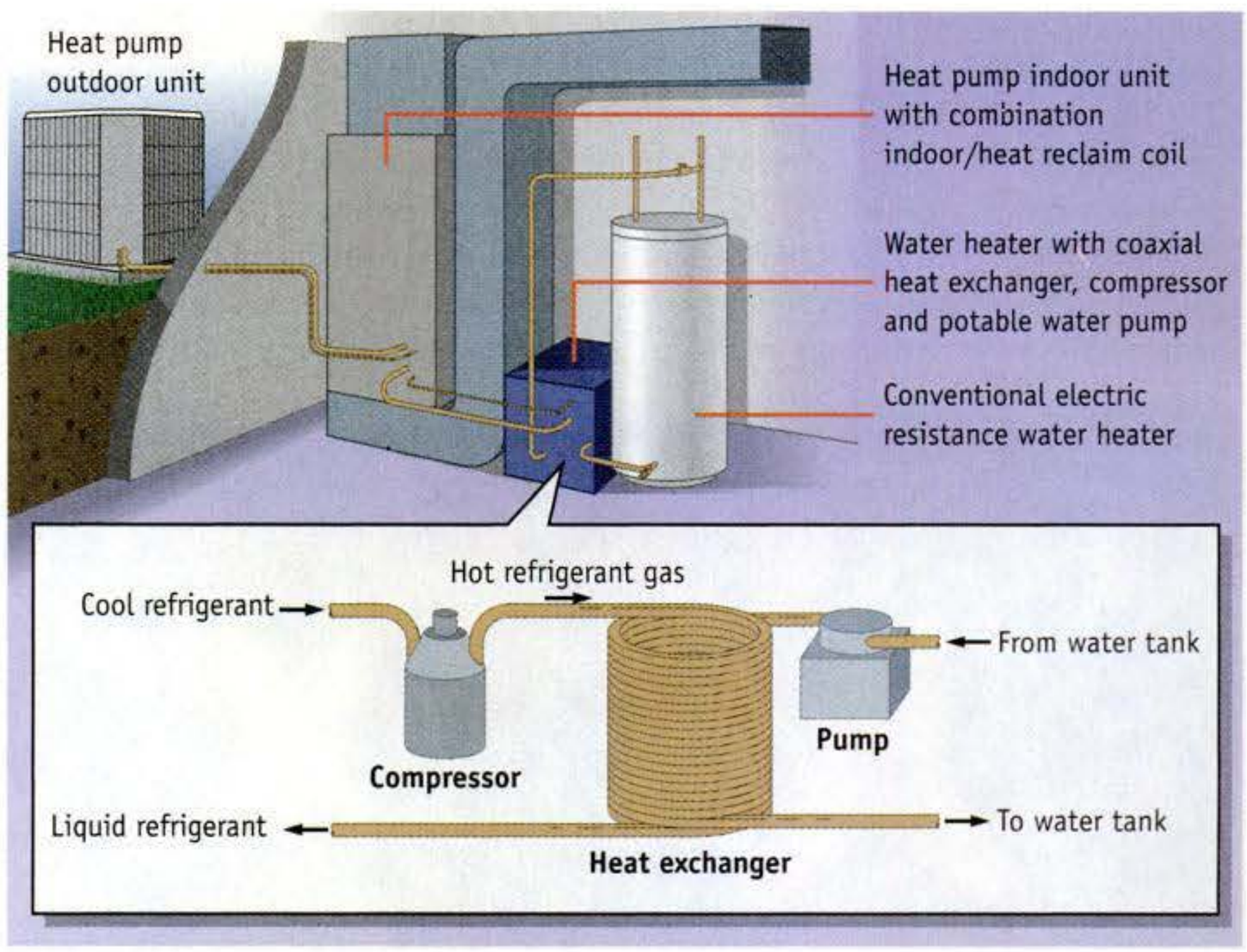
The AquaPlus system consists of two components: one that attaches to the house's air ducts, and another that connects to the hot-water heater. First, the AquaPlus uses a refrigerant-filled heat exchanger coil to capture warmth as hot air travels through the return air duct. The refrigerant then flows to the separate unit that houses a compressor and water pump. There, the refrigerant transfers its heat to water, which is added to the electric hot-water-heater tank.

Because AquaPlus is removing heat from the house, it does double duty by serving as a supplemental air conditioner. "You get about one [refrigeration] ton of 'free' cooling while you're heating your water," says Lennox engineer Greg Bennett. That only occurs, however, when the AquaPlus is operating to heat water; it isn't designed primarily as a backup air conditioner.

The system is most beneficial in warm climates, where space cooling is in greater demand than heating. During cold weather, an outdoor thermostat can be installed to override any commands from the hot-water tank to heat water, preventing the system from pulling heat from the rooms.

While the Lennox system isn't the first to reclaim space heat for domestic hot water, it is one of the most affordable: At an estimated $1,200, including installation, the AquaPlus could pay for itself within three to five years, depending on climate and hot-water usage, according to estimates by the Dallas, Texas, manufacturer. Moreover, because the AquaPlus can operate with a home's existing heat pump, says Bennett, a homeowner could install it without having to replace the entire heating and cooling system.—*J.A.G.*

K. DANIEL CLARK



In a Lennox system, warmth captured from return air heats water pumped along a heat exchanger.

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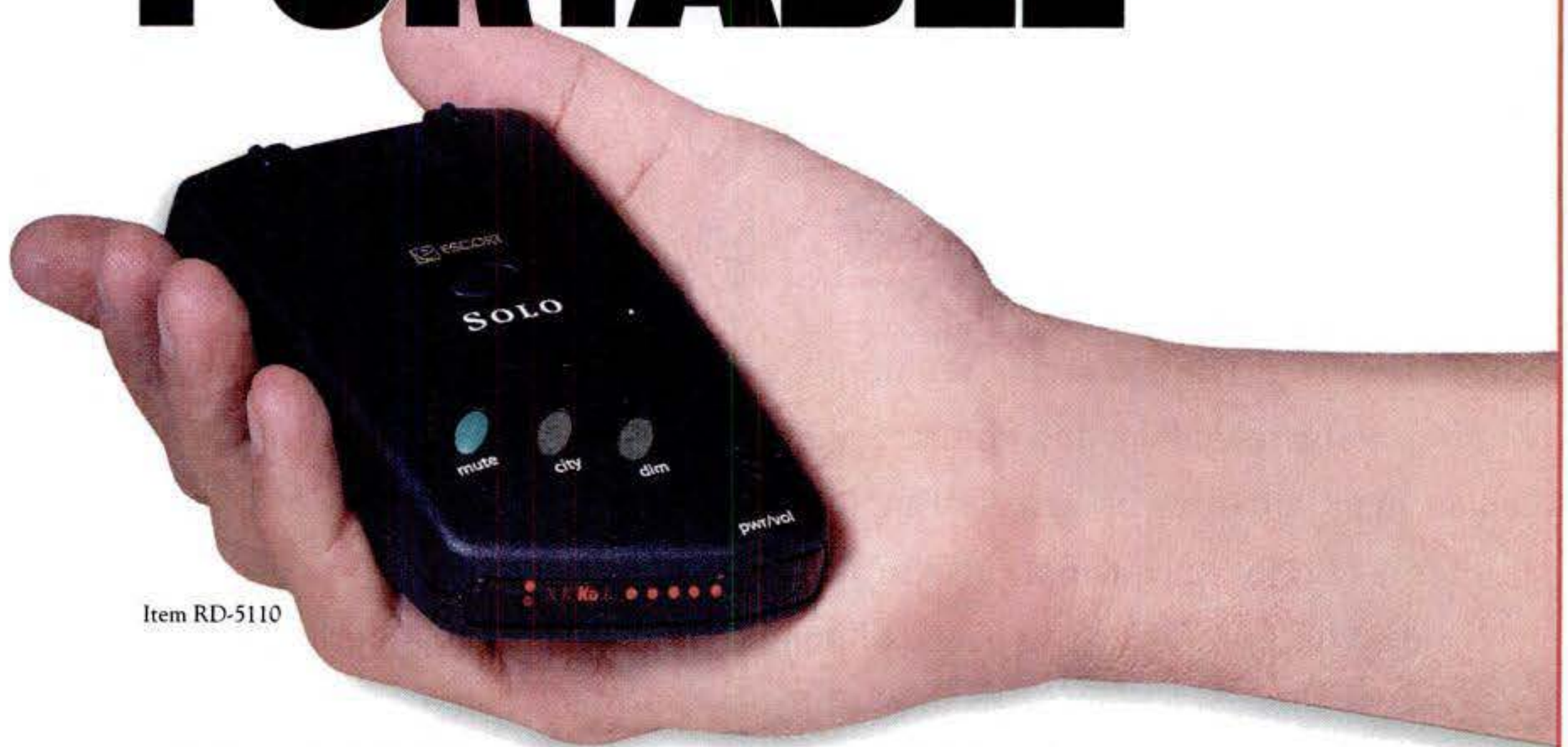

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AUTOMOTIVE

EDITED BY DAN McCOSH

PREVIEW DRIVE

Mercedes with Bugs in Your Teeth

THIS SPRING, THE new Mercedes SLK will roll into the United States. Mercedes' first Kompressor (German for supercharged) since the 1930s, the SLK boasts compelling credentials: 191 horsepower, sports-car agility, and its trump card, a retractable hardtop. All for an un-Mercedes-like $40,000.

Mercedes calls its new top the Vario Roof, a hydro-mechanical marvel that folds itself neatly in half and stows itself under the double-hinged decklid at the touch of a button. The process consumes a longish 25 seconds, which is about 20 seconds longer than the one-handed flip-fold operation for the manual top of a Mazda Miata or BMW Z3. But it's endlessly entertaining to watch, and it yields benefits softtops just can't match: far better security against theft and vandalism, and far lower interior noise levels with the top up.

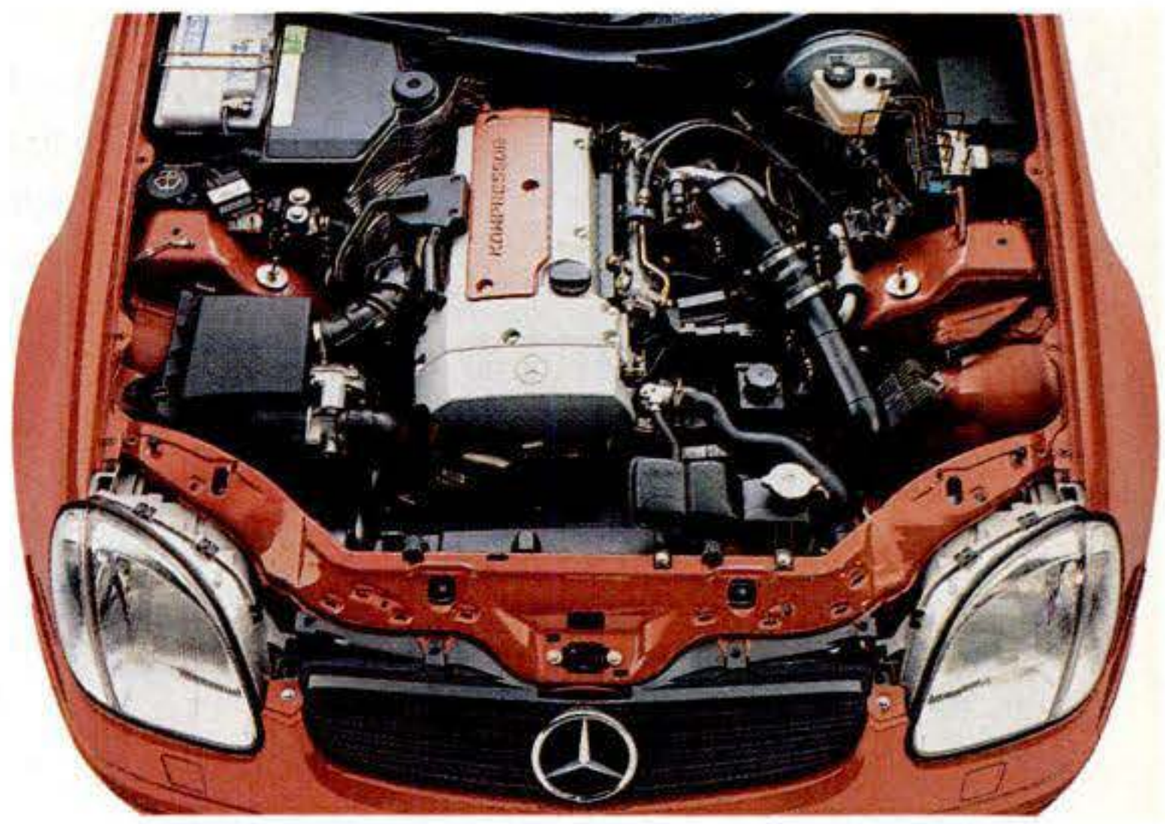
The SLK's chassis feels totally devoid of flex. The car is shorter than the C-class sedan it's derived from, but track dimensions are almost identical. The suspension elements—double wishbones up front, multi-link at the rear—are straight from the C-Class parts bin. The disc brakes, with ABS, are borrowed from the E-Class.

With an Eaton supercharger bolted to its 2.3-liter double overhead cam 16-valve engine—another C-Class adaptation—the SLK's engine generates 207 foot-pounds of torque. The engine nonetheless hauls the car's 2,922 pounds with the curve virtually flat from 2,500 rpm to its peak at 4,500 rpm. The transmission available in the United States is a five-speed automatic.

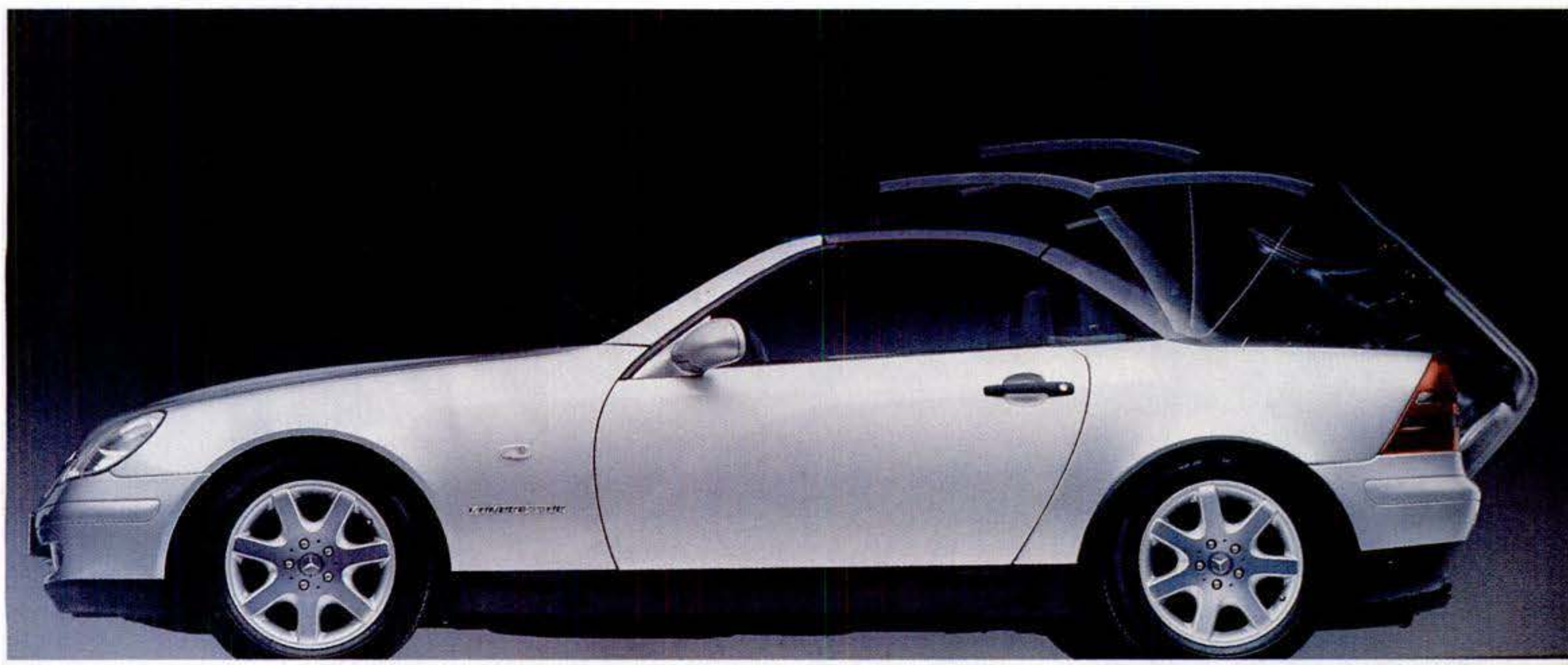
Inside, the new baby Benz is snug, but roomy in the dimensions that count—leg, head, and hip. The bucket seats could use more side bolstering, but they're comfortable and easily adjustable.

The SLK features a sensor that pre-empts the front passenger airbag when a special rear-facing child seat is buckled into the right side. Reinforced windshield pillars and a pair of steel-tube hoops mounted behind the seats and extending above the headrests protect passengers in the event of rollovers.

Stir in a jaunty exterior design, and you have a very appealing sports car, delightfully quick on its feet, a pure pleasure to drive.—*Tony Swan*



The SLK's supercharged, 2.3-liter DOHC 16-valve engine produces 191 horsepower and 207 foot-pounds of torque. The U.S. version has a five-speed automatic transmission only.



The stylish profile of the SLK hides the fold-away hardtop, which uses a hydro-mechanical mechanism to stow under the decklid.

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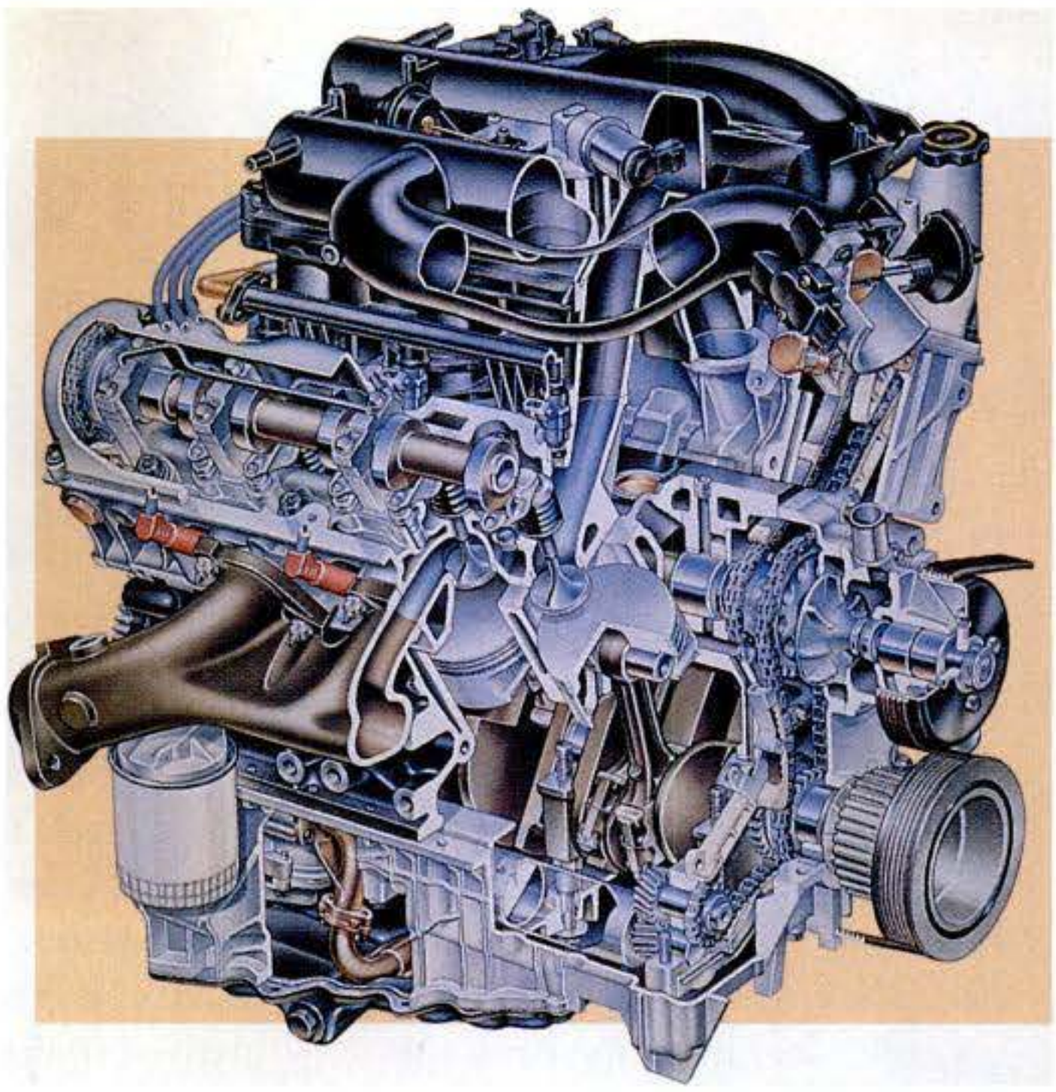
ENGINES

Explorer Gets Overhead Cam

AN OVERHEAD-CAM V6 in the Ford Explorer adds an optional engine in one of the more popular sport utilities on the road.

The new 4.0-liter powerplant produces 205 horsepower at 245 foot-pounds of torque, compared with 160 hp and 225 ft.-lbs. of torque for the base engine, a pushrod 4.0-liter V6. The engine uses a cast-iron block and aluminum heads. A two-stage manifold amplifies low-end torque. The power upgrade comes with a slight improvement in fuel economy as well. The new engine adds to a lineup that tips out with a 210-hp, 5.0-liter V8.

In addition to improving fuel economy, the new V6 is considerably smoother than the base engine. Other additions to the 1997 Explorer are a new five-speed automatic transmission and a modified computer-controlled transfer case. The Control Trac four-wheel-drive system has been altered to minimize wheel slip by monitoring and adjusting torque to the front wheels. In addition, a new "high" mode now locks 4WD in high gear. Both changes are a response to criticism of the earlier system that allowed some rear-wheel slip in icy conditions before engaging the front axle. New constant-velocity joints further refine the 4WD system.—*D.M.*



The new Explorer V6 engine increases power and improves mileage.

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PREVIEW DRIVE

GM Ventures a Better Van

GM'S NEW MINIVAN fleet includes the 1997 Chevy Venture, Olds Silhouette, and Pontiac Trans Sport. The standard (and only) 3.4-liter V6 politely pours out 180 horsepower. Accelerations are especially smooth, though the four-speed automatic often required a perceptible downshift as we took on the slopes of Route 112 in New Hampshire's foothills. Stops are sure and pulse-free with the standard ABS brakes.

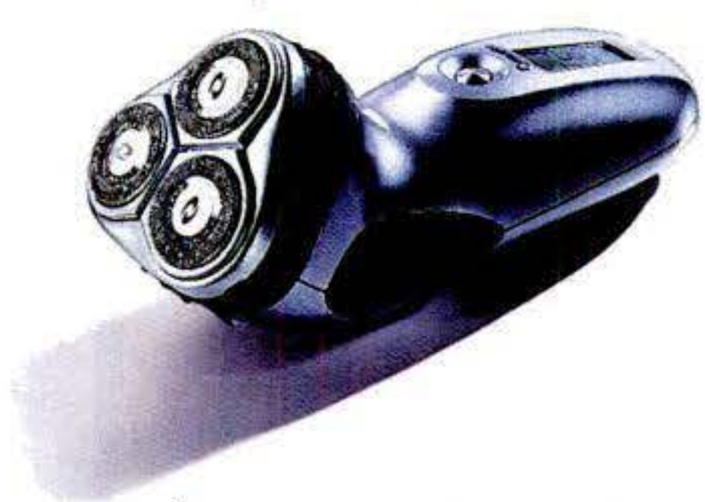
Each minivan in this GM trio comes in regular and extended wheelbase models. The GM minivans are a hair longer in each version than their chief competitor, the Chrysler Caravan, but they are several inches narrower. Still, the Venture and company have a spacious feel, thanks in part to wider, taller openings for the sliding doors. A second sliding door is optional, as is an automatic passenger-side slider.

Modular, clip-in or -out seating brings people-carrying flexibility to GM's all-new steel body minivans.

This drive included two small children who were attracted to the door mechanism like candy, to the discomfort of their parents. The four-year-old frequently chose to open the door without warning, and it took a father's intervention to keep the door from closing on him. The mechanical child lock is overridden by the electric mechanism and the electric lockout is on the overhead switch panel, within easy reach of an inquisitive child. I experimented with the mechanism designed to reverse the door's slide when it closes on a kid or object, and it dealt an uncomfortable blow to the arm.

Still, there's much to recommend GM's threesome, including touches like a pollen filter, single or dual integrated child seats, and literally dozens of cup and trash—I mean, cargo—holders.

—*Chris O'Malley*



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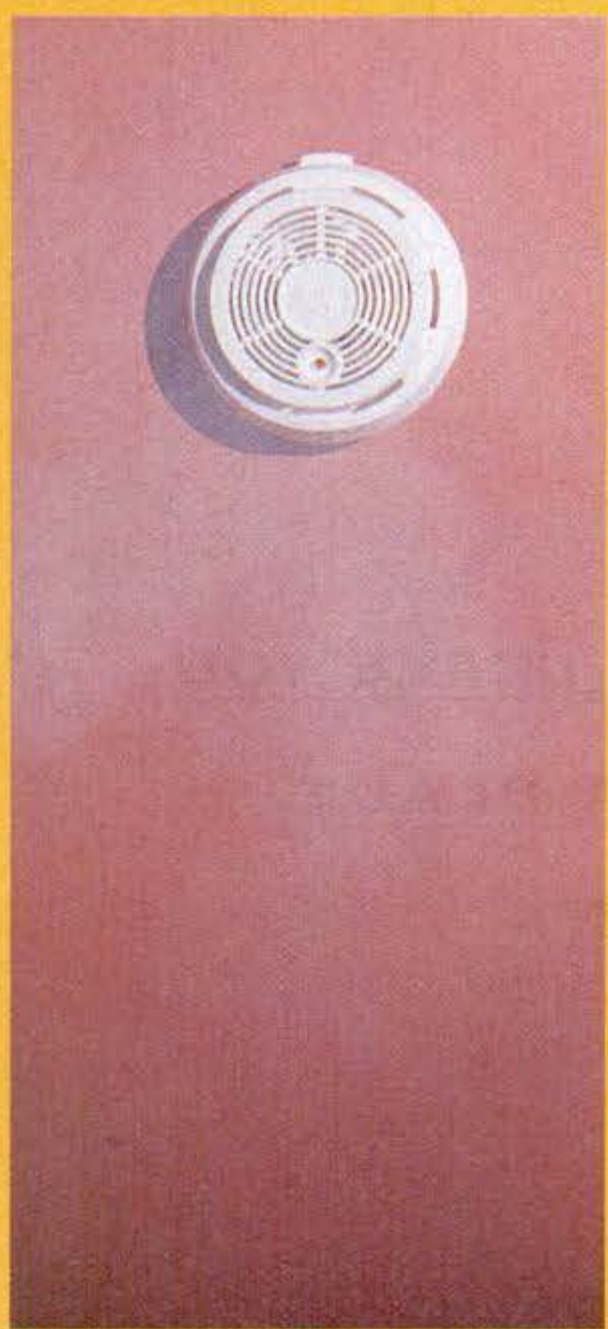

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CENTRAL BOILER

HANDLING

Power Control

HONDAS NEW Prelude introduces a twist to the growing number of systems that automatically redistribute torque to driving wheels to control the handling dynamics of the car. Up to now, this has been accomplished by differential braking of single wheels, which has a dramatic effect on vehicle stability.

The Honda system, on the 1997 Prelude, intervenes by activating a clutch in the front differential that directly redistributes torque between

Prelude's twist: an advanced traction system.

the driving wheels. The engine control system activates the clutch with additional input from steering wheel sensors and G-sensors. Cornering, the outside wheel gets additional power, which redistributes the steering force.

The system can distribute as much as 80 percent of the power to the outside wheel in a tight corner, while increasing the outside wheel speed as much as 15 percent. The effect: a car that handles more neutrally whether you put your foot on the gas pedal or take it off.

The greatest benefit may come in the near future, however, as a four-wheel-drive system, already developed, finds its way into sport-utility vehicles. The distribution of torque would eliminate many of the traction limitations that occur with some conventional four-wheel-drive units that rely on open differentials.—*D.M.*

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SAFETY

The Crashworthy Crown?

The exterior on Audi's A8 hides a radical, extruded-aluminum structure.

AUDI'S A8 luxury sedan is an avant-garde exercise in aluminum technology. Designed to compete in the stratospheric European luxury car segment, the A8 will shortly go on sale in the United States.

The innovative structure drew considerable attention when the car was launched in Europe two years ago. But the A8 is making other waves as well, incorporating the most advanced passive restraint system in use today.

The aluminum structure, a welded combination of extrusions and high-strength castings, absorbs energy via collapsible columns up front. These yield while the main cabin structure remains intact, even in offset collisions that concentrate the impact on a portion of the front end. The doors are designed as crash-resistant cells, filled with foam.

Six airbags enhance the protection. To supplement the two front bags, two side-impact bags deploy from the edge of the front seat, and two more side-impact bags protect passengers in the rear seats. Timing of bag deployment is linked to a sensor that determines if the seat is occupied, and if the belt is connected. An unbelted passenger causes the bag to deploy more quickly than with a belted passenger, and an unoccupied seat prevents deployment. A pretensioner, a device that tightens the seat belt, may be activated in certain conditions.

This marked advance in passenger protection is housed in a high-tech luxury car that, even with four-wheel drive, will soon go on sale for a little more than $60,000.—*D.M.*

The Audi's passive restraint system includes six airbags—among them four side-impact bags—and sensors that deploy them according to the speed of impact.

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NORELCO REDEFINES HOW MEN GET QUALITY 'FACE TIME'

If there's anything that appeals to American men, it's getting quality face time. And that's exactly what happened when some of the nation's most respected athletes, corporate leaders, media professionals and consumers were asked to try a revolutionary new electric razor.

When they replaced their blades with the Norelco Reflex Action Razor for a "21-Day Test Drive," the results were overwhelming:

- **94%** of those surveyed reported fewer nicks and cuts from Norelco Reflex Action compared to blades.
- **83%** of respondents said the Reflex Action delivered a "great" shave with less irritation than blades.
- **81%** said they planned to switch from their blades to the Reflex Action Razor.

These results come on the heels of what researchers have known for some time; the Norelco Reflex Action shaving system has been *clinically proven* to give you a great-looking shave with less irritation.

TAKE THE 21 DAY TEST DRIVE

Now Norelco is offering a 21-Day Test Drive to more than three million men—complete with a chance to win a Dodge Viper GTS Coupe.

"Try it for 21 days," the promotion offers. "If you don't get a great-looking shave with less irritation than your current blade, you'll get your money back and more." For more information on the Norelco Reflex Action Razor or this offer call 1-800-483-4973.

Check out the Norelco Reflex Action Razor at a retail store near you.

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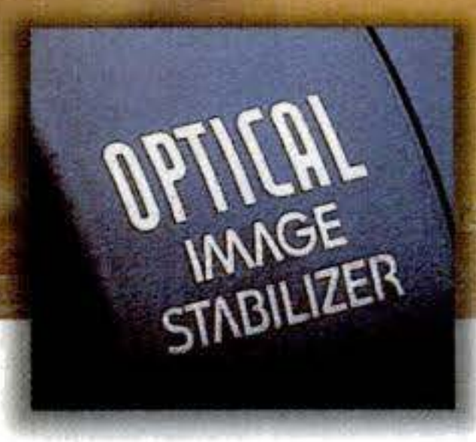

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ELECTRONICS

EDITED BY FRANK VIZARD

BOOM BOXES

Bijou in a Box

MORE AUDIO BRANDS are adding surround-sound capability for video to their minicomponent systems—the concept that first brought high-quality stereo to low-square-footage dwellings like apartments.

Packages by JVC and Aiwa are typical of the field—decoding for Dolby Pro Logic surround-sound is built into the machine, along with multichannel amplifiers to power the included five speakers.

Aiwa's ambitions in home-theater sound comprise four Mini Theaters, costing from $600 to $1,000. Each includes a three-disc CD changer, two auto-reverse cassette decks, and an AM/FM tuner. The top-of-the-line, 240-watt NSX-AVH90 comes in two pieces that can be stacked or placed side by side. With similar features and a flexible two-piece design, JVC's MX-D8T ($650) sends 200 watts to its five compact speakers.

The 13-inch GXTV from Samsung works as a mini home theater.

Some new combination products also address a small home-theater's distinct requirements. One hybrid from Aiwa combines a hi-fi VCR and feature-laden audio/video receiver in a single chassis. The AV-X500 ($650) has Dolby Pro Logic decoding and 400 watts of multichannel amplification. Already have a hi-fi VCR? Another combo, the AV-X300 ($500) swaps the video deck for a five-CD carousel changer.

One offbeat product that is designed to enhance video games but can be adapted for a mini home theater is the GXTV ($349), from Samsung. The speakers housed in the door panels covering this 13-inch stereo TV can be adjusted for better sound imaging. The screen is also designed to resist burn-in from stationary video-game images.

The door speakers' 3-watt amps needn't handle the deepest bass: That's done by a top-mounted 15-watt subwoofer. GXTV can derive a surround-sound effect from its three speakers, and it includes a variety of sound modes for different kinds of video games, such as road races or blast 'em-ups. Conveniently, the 181-channel TV has enough inputs to handle an antenna cable plus three components, including game consoles or VCRs. An output jack lets you route sound to an external stereo system.
—*Stephen A. Booth.*

HANDS ON

Tapeless Note Taker

SOMETIMES A GREAT notion occurs when neither pen nor paper is handy to jot it down—say, when you're driving a car. Later, you wrack your brain to remember, but time has erased all but wisps of your idea. An antidote for this frustration is Total Recall, a palm-sized digital recorder that's a great memory enhancer, and looks cool as well.

Being digital, Total Recall offers several advantages. First, you don't have to deal with tape, so say good-bye to endless rewinding or fast forwarding to find the segment you want. Total Recall allows you to put voice notations in any one of three folders for easy retrieval. Second, you can selectively erase or add to existing messages at the touch of a button—addendums go where they belong.

Third—and perhaps most exciting of all—you can download your voice notes to a personal computer, a capability not offered with other pocket-sized digital recorders we've seen. Voice notes are converted to standard WAV files so it's easy to attach them to computer document files or even send them over the Internet. This PC Audio Link package is available separately for a list price of $60.

The 3-ounce Total Recall recorder, made by Sycom Technologies of Bala Cynwyd, Pennsylvania, is priced from $99 to $199. Recording capabilities vary from 5 to 23 minutes depending upon the model. These numbers reflect optimum recording quality. For example, you can extend the recording time to 47 minutes on the most expensive model if audio quality isn't a great concern.—*F.V.*

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AUDIO

Mood Music

Biorhythmic boom box picks music for the day.

TALK about reaching niche markets: Samsung's got the inside track among New Agers by virtue of a minicomponent stereo that calculates the user's biorhythms and suggests the music most appropriate to the day.

For the uninitiated, biorhythm is a notion that one's physical, emotional, and intellectual states vary, respectively, in cycles of 23, 28, and 33 days. Biorhythmic theory doesn't enjoy the scientific sanction accorded to circadian and circannual rhythms. But what the hey—it didn't stop Samsung from adding "Bio EQ" to its MAX-555 ($350), a nice-sounding 40-watt minisystem with 3-CD changer, dual cassette, AM/FM, and other features. These include "BGNS" (Background Natural Sound), which pipes in the sounds of a forest, a stream, or the ocean surf to create a relaxing atmosphere.

Bio EQ works like this: Once the unit is programmed with the current date, users enter their birth dates and get a readout of their biorhythm status. Then, Bio EQ suggests a music genre suitable to that day (Rock, Classical, or whatever Pop is supposed to mean).

You're out of luck if you've still got rhythm of any kind after Dec. 31, 2010. That's the extent of Bio Ed's short-range calendar. Guess they expect you to buy something new by then.—*S.A.B.*

HIGH-DEFINITION TV

Definition Closer?

WAS SOMETHING missing—or added—when experimental station WHD broadcast clips from *Lawrence of Arabia* in the first public demonstration of high-definition television?

Depends on whom you ask...and detractors would say, "Both."

The August 6 telecast transmitted the 1962 gem in its original Super Panavision 70 aspect ratio—as much as 2.35 times wider than its screen height. Yet the kind of HDTV receivers used have a 16:9 aspect ratio, or 1.78-to-1. Such a mismatch results in those black bars above and below the image, commonly called "letterboxes."

The naysayers, primarily from fee-based services, want an HDTV transmission method that accommodates reception on screens with at least 2:1 proportions. In other words, they do not want the Federal Communications Commission to adopt an HDTV standard based on the 16:9 system developed and proposed by the so-called Grand Alliance, a consortium of electronics and broadcast companies.

A secondary issue is progressive scanning, used in noninterlaced PC monitors, where the entire screen image is built rapidly one line at a time rather than in the alternating, every-other-line fashion of today's telecasts. The Grand Alliance method embraces both, reserving interlaced scanning as an option for lower resolution, terrestrial broadcast applications. Opponents want only the higher picture quality of progressive scanning.

But momentum for an FCC-mandated standard is building. Both the Clinton administration and bipartisan supporters in Congress endorse the argument by broadcasters and equipment manufacturers that a clear-cut standard is needed to get HDTV airborne.—*S.A.B.*

HANDS ON

Video Without Wires

TRANSMITTING A VIDEO signal from one room to another wirelesssly has been made a lot simpler, thanks to the recent availability of the 2.4GHz frequency for that very purpose. In the past, wireless devices have used the crowded 900MHz band—home to cordless phones—and the resulting interference generated poor performance.

We field tested one of the first 2.4GHz devices available, the Wavecom Jr. from RF Link Technology of Torrance, California, and found it to work as advertised. Both the audio and video signals were crisp and clear. Installation is very simple and should be a breeze for anyone who has ever connected a VCR to a TV.

The Wavecom Jr. is actually two small units: a receiver and a transmitter. Both have rotating antennas that must be positioned so the pitted sides are pointing toward each other. The range is about 300 feet, but the transmission is not line-of-sight. The signal will penetrate through walls. About the only source of interference that may be common inside the house is a microwave oven placed between the transmitter and receiver. Any other interference may be circumvented by switching among the four transmitting channels, much as you would switch between cordless phone channels in a similar situation. List price for Wavecom Jr. is $200, which is a lot more than wires cost, but the flexibility you get is worth the extra dollars.—*F.V.*

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VIDEO

What's Lux Got to Do with It?

YOU'LL BE TEMPTED to think "They don't make 'em like they used to" if you compare the low-light sensitivity of 1997-vintage camcorders against that of older models.

It's a reasonable assumption. The low-light ratings, measured in lux, will be two to five units higher than the 1- to 2-lux scores posted until now.

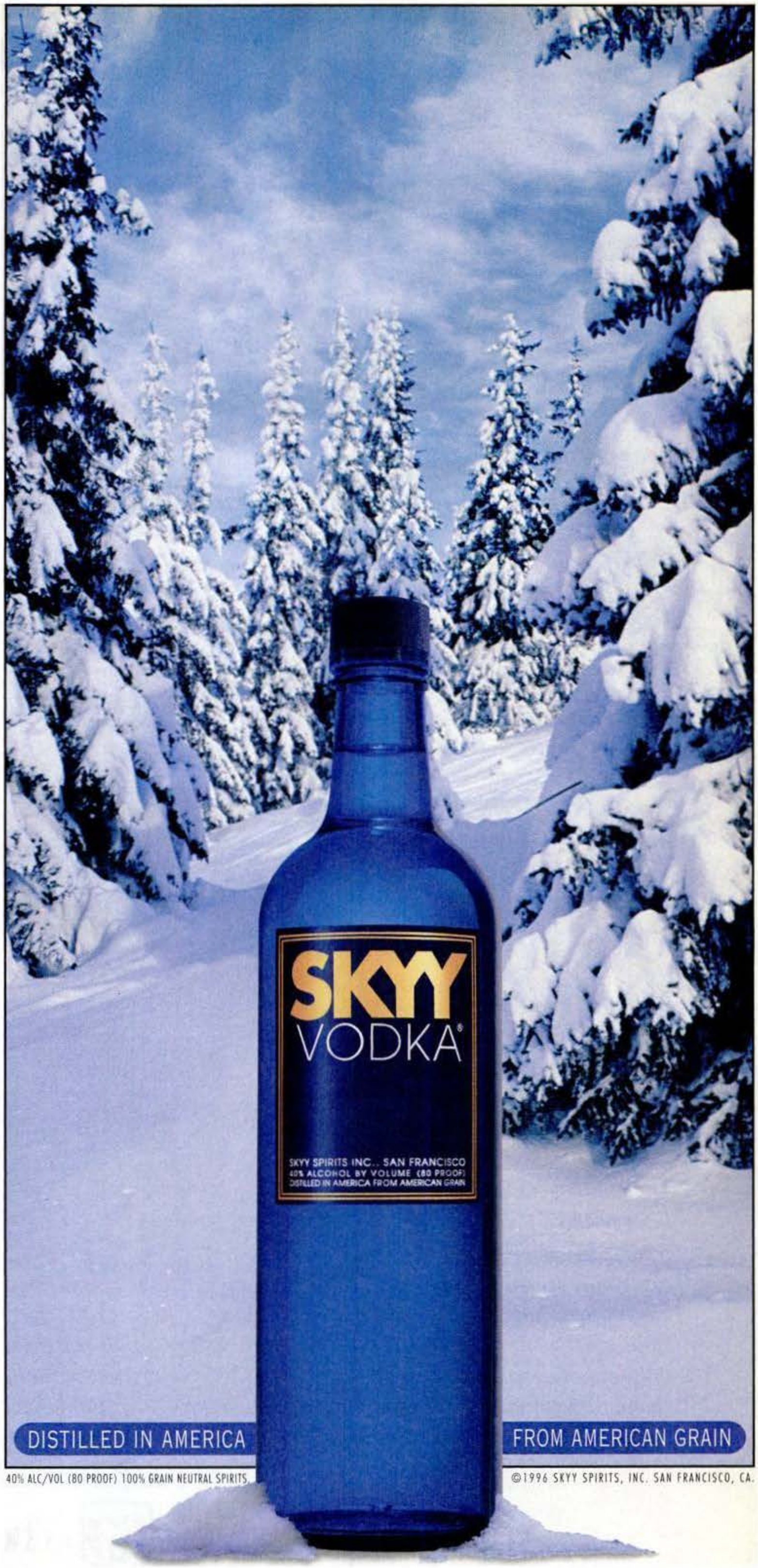
Camcorders haven't gotten worse. In fact, they've become more sensitive to light. But manufacturers have finally agreed on a single standard for measuring light sensitivity, a standard that reflects that heightened sensitivity. These measurements, developed by the Electronic Industries Association, will be used on all packaging.

Lux is a metric version of the foot-candle measure. One foot-candle is the illumination on a surface one foot distant from a standard candle in a dark room—and it's equal to 10 lux.

Recent camcorders are so light sensitive that some register images in less than 1 lux. That's by a conservative measurement formerly used at the Advanced Product Evaluation Laboratory in Bethel, Connecticut, which performs independent tests for retailers. The EIA standard is a recalibration that expresses subtle differences more forcefully than previous methods.

According to APEL president Frank Barr, two 1996 camcorders tested by the EIA method and APEL's former method yielded the following results. A high-end model rated at 0.54 lux weighs in at 2.7 lux. A midrange camcorder, formerly 1.6 luxs, now hits 5.7 on the EIA scale.

The EIA lux standard also mandates specific performance levels in other key camcorder measurements. Thus, a manufacturer can't steal a better lux rating at the cost of fuzzy, grainy images.—*S.A.B.*



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Dodge Ram boasts the most available payload and towing, too. And when you consider that for the past two years Ram has received Strategic Vision's Total Quality Award™ for "Best Owner Experience" in a full-size pickup†...well, you're bound to like it. Leather or not.

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SCIENCE & TECHNOLOGY

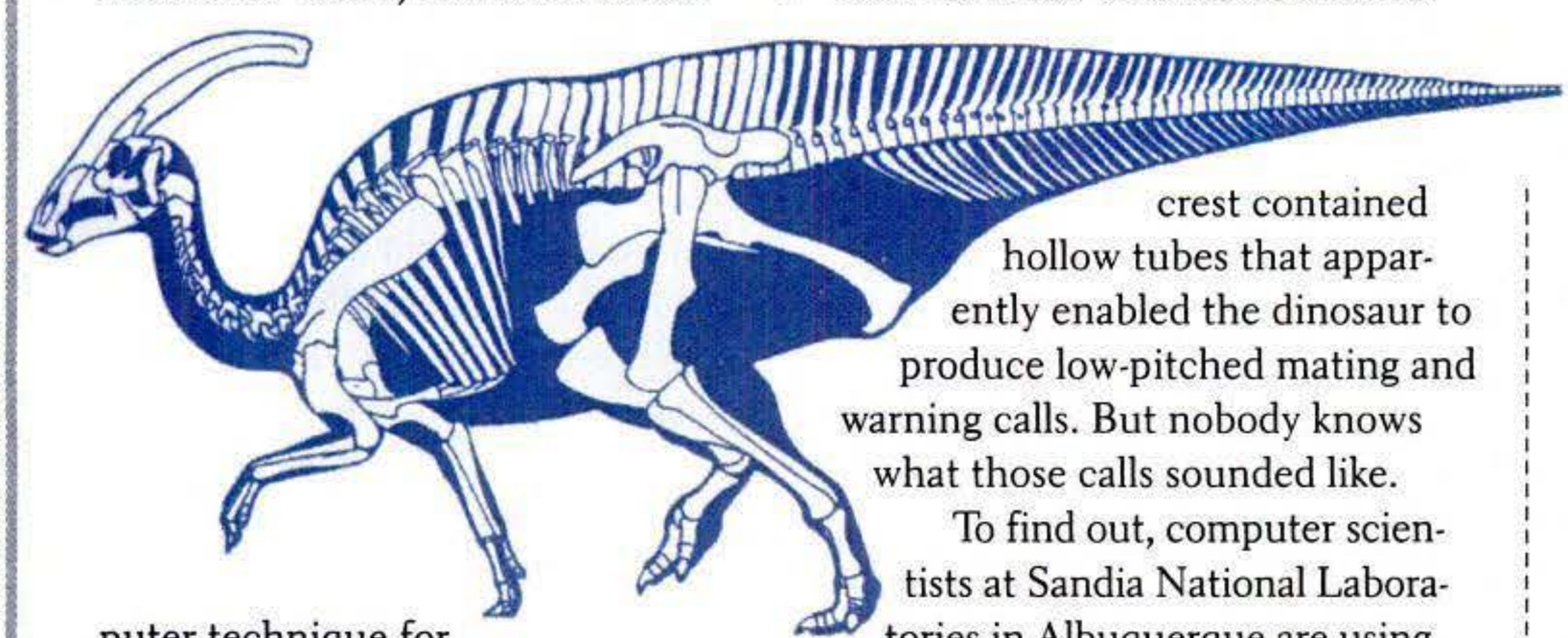
EDITED BY DAWN STOVER

DINOSAURS

Jurassic Bark

SCIENTISTS CAN'T bring dinosaurs back to life, but now they can bring back their voices, thanks to a computer technique for reconstructing dinosaur anatomy. The new technique will enable scientists to make "recordings" of the sounds made by a rare "duckbill" dinosaur called *Parasaurolophus*, a 30-foot-long animal that lived about 75 million years ago during the Cretaceous period, near the end of the dinosaurs' time on Earth.

This plant-eating dinosaur, which appeared in the movie *Jurassic Park*, sported a bony crest curving back from its skull. This trombone-like crest contained hollow tubes that apparently enabled the dinosaur to produce low-pitched mating and warning calls. But nobody knows what those calls sounded like.



THE DINOSAUR ENCYCLOPEDIA

To find out, computer scientists at Sandia National Laboratories in Albuquerque are using special software to analyze 350 CAT scan images of a *Parasaurolophus* skull that was excavated last year in northwestern New Mexico. The software is helping the scientists map out the intricate network of air passageways within the animal's skull. Working with experts at the New Mexico Museum of Natural History, the Sandia scientists will then be able to create computer simulations of the sounds that the dinosaur produced with its unusual skull.

RAY NELSON

CAT scans of an unusual dinosaur skull could help scientists recreate sounds that haven't been heard for 75 million years.

The Sandia team hopes to use the same techniques to recreate the sounds of other dinosaurs in the duckbill family. The project builds on earlier efforts by David Weishampel at Johns Hopkins University, who constructed a mechanical model of the dinosaur's crest from plastic tubing and a trumpet mouthpiece in an attempt to imitate the animal's sounds.—*Ray Nelson*

MILITARY TECH

Big Zapper

IN THE YEAR 2000, the U.S. Air Force plans to fly a modified Boeing 747 jetliner armed with a laser powerful enough to destroy a Scud-type ballistic missile up to 250 miles away. Pentagon leaders believe that the Airborne Laser (ABL) may be the most promising way of destroying missiles while they are still accelerating upward, ensuring that their warheads will not fall on territory defended by the United States.

Two technical breakthroughs have made ABL possible. Earlier laser weapons would not work at long range in the atmosphere, because air turbulence made the beam jitter. ABL uses "adaptive optics" to overcome this problem. A low-powered laser illuminates the target, a sensor on the 747 tracks the reflected light and calculates the atmospheric distortion, and computers send correcting signals to deformable mirrors that keep the laser focused on the missile for the few seconds required to destroy it.

A laser carried aboard a modified 747 could shoot down ballistic missiles.

The other key to ABL is a high-efficiency chemical oxygen-iodine laser that generates a lot of power from a small amount of fuel. The laser should fit on a 747, together with enough hydrogen peroxide fuel for at least 20 missile kills.

Rockwell and Boeing are leading competing ABL teams, and the Pentagon plans to choose one of them to start building a prototype in early 1997. The Air Force wants to keep the prototype ready for wartime use after tests are completed in the year 2002.—*Bill Sweetman*

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THE SUN

Flare Watcher

A BALLOON-BORNE telescope is giving solar scientists a new view of the surface of the sun. The Flare Genesis experiment, devised to learn the cause of solar flares, uses a 32-inch telescope suspended beneath a 128,000-cubic-foot research balloon. Originally built for the U.S. "Star Wars" program, the telescope is designed to fly for three weeks at 125,000 feet, recording as many as 100,000 images of the sun. With image quality 10 times that of solar observatories on Earth, it can see features as small as 100 miles in diameter on the sun's surface.

RAY NELSON

The Flare Genesis telescope can see detailed features on the sun's surface.

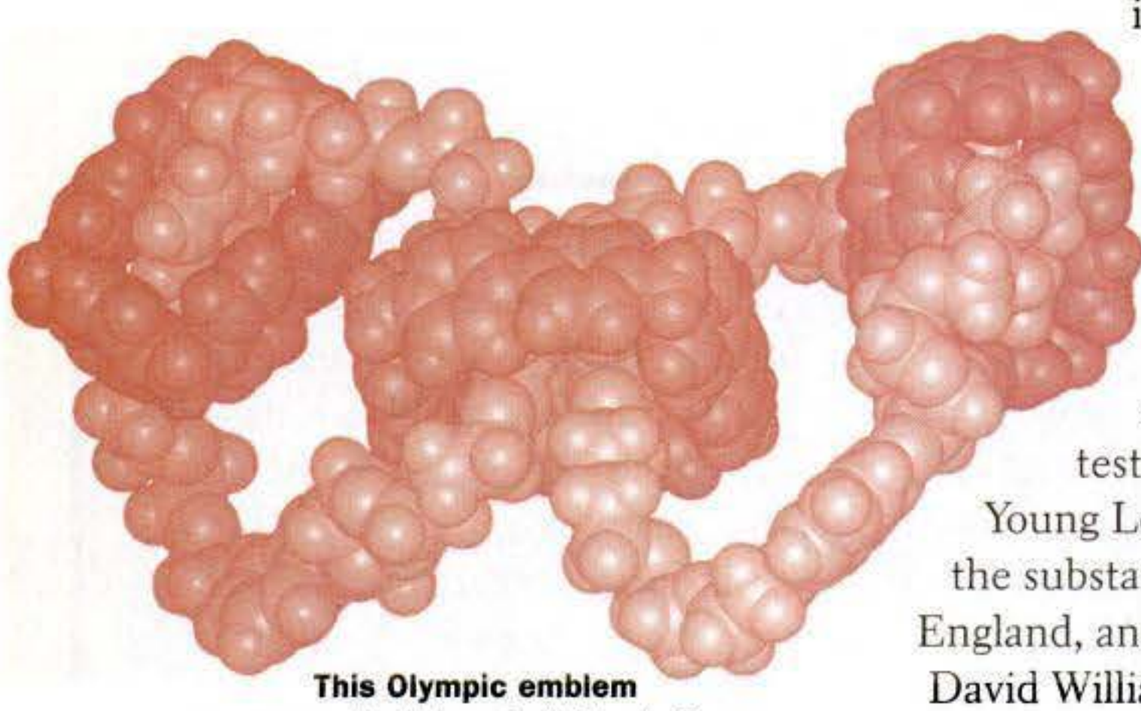
Flare Genesis was first launched in January near the U.S. McMurdo Base in Antarctica, where it was able to take advantage of the 24-hour summer daylight. It followed a roughly circular path around the Antarctic continent, was blown off course by erratic winds, and finally landed in a region known as Wilkes Land after a 19-day flight.

The high-flying telescope is built for repeated flights, but it has a rough life, taking a lot of shock as the parachute opens for descent, then more when it hits the ice and gets bounced around and possibly dragged for a distance. Future flights might confirm a new theory that magnetic fields twist into ropelike structures, which then intertwine with one another and eventually blow up as solar flares.—*R.N.*

CHEMISTRY

Molecular Olympics

WHILE ATHLETES were warming up in Atlanta, chemists in England were racing to make an "Olympic molecule." A team led by Fraser Stoddart, an organic chemist at the University of Birmingham, England, relied on years of chemistry training to link five molecular rings in the shape of the Olympic emblem. The molecular structure, called an olympiadane, is far smaller than any emblems you may have seen while watching the games.



This Olympic emblem was assembled from individual atoms.

Large molecular "architectures" such as olympiadanes are constructed though the use of a self-assembly technique. "Several 'intelligent' building blocks organize each other into a well-defined shape," explains team member David Amabilino.

To prove that his teammates had created an olympiadane in their test tube, chemist Yu Young Lee grew crystals of the substance in Birmingham, England, and rushed them to David Williams at Imperial College in London. Williams, who is an expert in taking X-ray snapshots of atoms in crystals, then produced a picture on the penultimate night of the Olympic Games, showing the molecular emblem in all its glory.

The researchers have already begun working on a seven-ring chain and hope to have linked hundreds by the next Olympics. Their efforts might lead to new types of polymers for "smart" materials and molecular computers.—*David Bradley*

MEDICINE

Honey, I Shrunk My Brain

TOO MUCH STRESS can shrink your brain. So says a Stanford University biologist studying the effects of stress on brain cells.

Research by Stanford professor Robert Sapolsky and others has shown that glucocorticoids—hormones produced in response to stress—can "shrivel" the neurons of lab rats. The effect on humans remained a question until now.

With improvements in magnetic resonance imaging, scientists have found neuron damage in human brains that appears in some cases to be caused by glucocorticoids. In one Harvard study, researchers found that Vietnam vets with post-traumatic stress disorder were more likely than other combat veterans to have a small hippocampus, a region of the brain responsible for some types of memory. However, Sapolsky says there is no evidence that ordinary levels of stress damage the hippocampus.—*D.S.*

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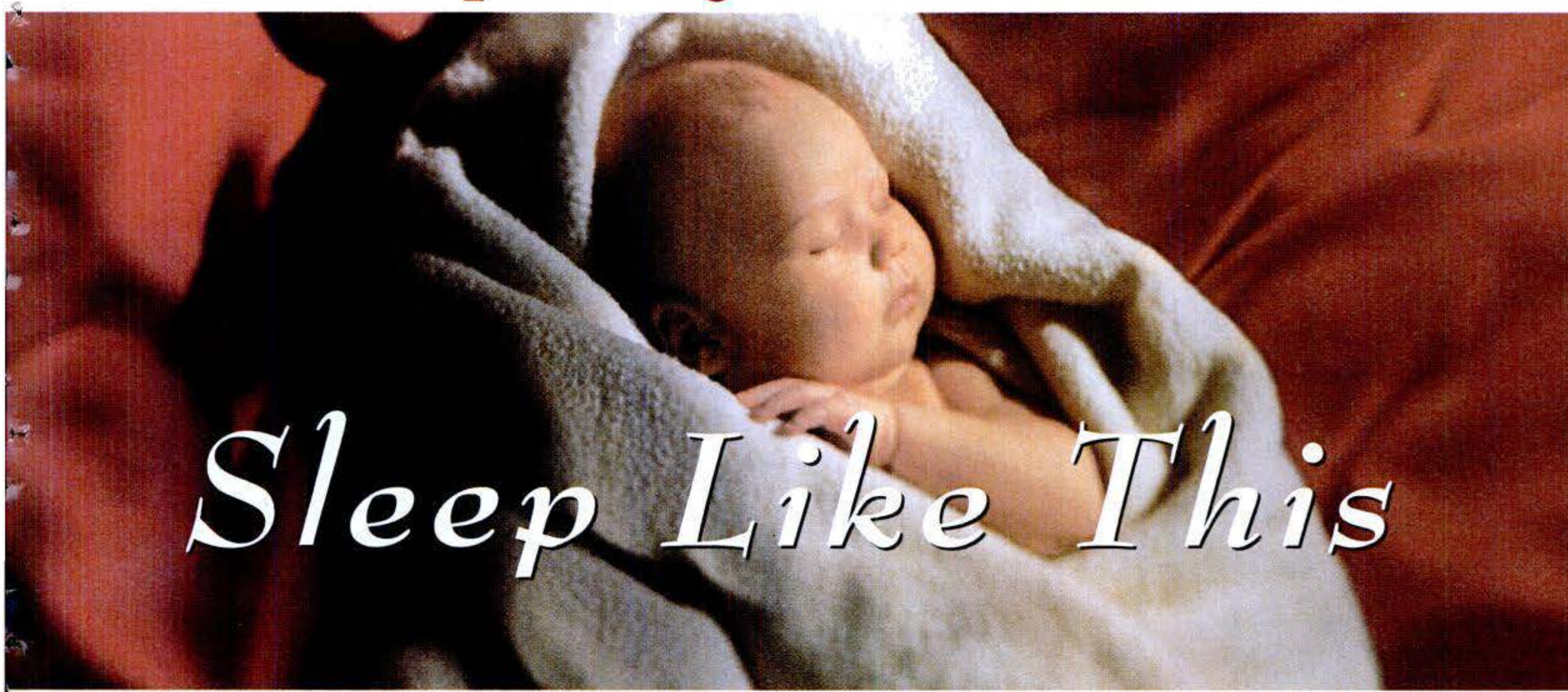
Now men who suffer from frequent nighttime urination can...



CARDURA®. The fast, easy treatment for frequent nighttime urination due to BPH.

Frequent nighttime urination is a common and bothersome symptom of benign prostatic hyperplasia (BPH), a noncancerous enlargement of the prostate gland occurring most often in men over the age of 50.

Cardura is a simple, once-daily tablet that quickly relieves urination problems caused by BPH, meaning your bladder can empty completely and you won't have to wake up as often at night to go to the bathroom.

Cardura may begin to improve urinary flow—day and night—in as little as 1 to 2 weeks.

Cardura is available only by prescription. So ask your physician if **Cardura** is right for you—if it is, your doctor can provide you with a trial pack to get you started.

Cardura can cause a sudden drop in blood pressure at the beginning of treatment or if you miss doses and then start taking the medication again. You may feel dizzy, faint, or light-headed, particularly after getting up from a chair or bed. Speak to your doctor about oral medications like Cardura and other treatment options for BPH such as regular monitoring of the condition or surgery.

Please see important information on the next page.

ONCE-A-DAY
CARDURA®
(doxazosin mesylate) Scored Tablets 1 mg, 2 mg, 4 mg, 8 mg

Cardura. Because BPH shouldn't be something to lose sleep over.

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ONCE-A-DAY
CARDURA®
(doxazosin mesylate) Scored Tablets 1 mg, 2 mg, 4 mg, 8 mg

PATIENT INFORMATION ABOUT CARDURA®
Generic Name:
doxazosin mesylate
FOR BENIGN PROSTATIC HYPERPLASIA (BPH)

Read this information:

- before you start taking CARDURA®
- each time you get a new prescription.

You and your doctor should discuss this treatment and your BPH symptoms before you start taking CARDURA® and at your regular checkups. This information does NOT take the place of discussions with your doctor.

CARDURA® is used to treat both benign prostatic hyperplasia (BPH) and high blood pressure (hypertension). This information describes CARDURA® as treatment for BPH (although you may be taking CARDURA® for both your BPH and high blood pressure).

What is BPH?

BPH is an enlargement of the prostate gland. This gland surrounds the tube that drains the urine from the bladder. The symptoms of BPH can be caused by a tensing of the enlarged muscle in the prostate gland which blocks the passage of urine. This can lead to such symptoms as:

- a weak or start-and-stop stream when urinating
- a feeling that the bladder is not completely emptied after urination
- a delay or difficulty in the beginning of urination
- a need to urinate often during the day and especially at night
- a feeling that you must urinate immediately.

Treatment Options for BPH

The four main treatment options for BPH are:

- If you are not bothered by your symptoms, you and your doctor may decide on a program of "watchful waiting." It is not an active treatment like taking medication or surgery but involves having regular checkups to see if your condition is getting worse or causing problems.
- Treatment with CARDURA® or other similar drugs. CARDURA® is the medication your doctor has prescribed for you. See "What CARDURA® Does," below.
- Treatment with the medication class of 5-alpha reductase inhibitors (e.g. Proscar®). It can cause the prostate to shrink. It may take 6 months or more for the full benefit of finasteride to be seen.
- Various surgical procedures. Your doctor can describe these procedures to you. The best procedure for you depends on your BPH symptoms and medical condition.

What CARDURA® Does

CARDURA® works on a specific type of muscle found in the prostate, causing it to relax. This in turn decreases the pressure within the prostate, thus improving the flow of urine and your symptoms.

- CARDURA® helps relieve the symptoms of BPH (weak stream, start-and-stop stream, a feeling that your bladder is not completely empty, delay in beginning of urination, need to urinate often during the day and especially at night, and feeling that you must urinate immediately). It does not change the size of the prostate. The prostate may continue to grow; however, a larger prostate is not necessarily related to more symptoms or to worse symptoms. CARDURA® can decrease your symptoms and improve urinary flow, without decreasing the size of the prostate.
- If CARDURA® is helping you, you should notice an effect within 1 to 2 weeks after you start your medication. CARDURA® has been studied in over 900 patients for up to 2 years and the drug has been shown to continue to work during long-term treatment.

  Even though you take CARDURA® and it may help you, CARDURA® may not prevent the need for surgery in the future.
- CARDURA® does not affect PSA levels. PSA is the abbreviation for Prostate Specific Antigen. Your doctor may have done a blood test called PSA. You may want to ask your doctor more about this if you have had a PSA test done.

Other Important Facts

- You should see an improvement of your symptoms within 1 to 2 weeks. In addition to your other regular checkups you will need to continue seeing your doctor regularly to check your progress regarding your BPH and to monitor your blood pressure.
- CARDURA® (doxazosin mesylate) is not a treatment for prostate cancer. Your doctor has prescribed CARDURA® for your BPH and not for prostate cancer; however, a man can have BPH and prostate cancer at the same time. Doctors usually recommend that men be checked for prostate cancer once a year when they turn 50 (or 40 if a family member has had prostate cancer). A higher incidence of prostate cancer has been noted in men of African-American descent. These checks should continue even if you are taking CARDURA.®

How To Take CARDURA® and What You Should Know While Taking CARDURA® for BPH

CARDURA® Can Cause a Sudden Drop in Blood Pressure After the VERY FIRST DOSE. You may feel dizzy, faint or "light-headed," especially after you stand up from a lying or sitting position. This is more likely to occur after you've taken the first few doses or if you increase your dose, but can occur at any time while you are taking the drug. It can also occur if you stop taking the drug and then restart treatment. If you feel very dizzy, faint or "light-headed" you should contact your doctor. Your doctor will discuss with you how often you need to visit and how often your blood pressure should be checked.

Your blood pressure should be checked when you start taking CARDURA® even if you do not have high blood pressure (hypertension). Your doctor will discuss with you the details of how blood pressure is measured.

Blood Pressure Measurement: Whatever equipment is used, it is usual for your blood pressure to be measured in the following way: measure your blood pressure after lying quietly on your back for five minutes. Then, after standing for two minutes measure your blood pressure again. Your doctor will discuss with you what other times during the day your blood pressure should be taken, such as two to six hours after a dose, before bedtime or after waking up in the morning. Note that moderate to high-intensity exercise can, over a period of time, lower your average blood pressure.

You can take CARDURA® either in the morning or at bedtime and it will be equally effective. If you take CARDURA® at bedtime but need to get up from bed to go to the bathroom, get up slowly and cautiously until you are sure how the medication affects you. It is important to get up slowly from a chair or bed at any time until you learn how you react to CARDURA.® You should not drive or do any hazardous tasks until you are used to the effects of the medication. If you begin to feel dizzy, sit or lie down until you feel better.

- You will start with a 1 mg dose of CARDURA® once daily. Then the once daily dose will be increased as your body gets used to the effects of the medication. Follow your doctor's instructions about how to take CARDURA.® You must take it every day at the dose prescribed. Talk with your doctor if you don't take it for a few days for some reason; you may then need to restart the medication at a 1 mg dose, increase your dose gradually and again be cautious about possible dizziness. Do not share CARDURA® with anyone else; it was prescribed only for you.
- Other side effects you could have while taking CARDURA,® in addition to lowering of the blood pressure, include dizziness, fatigue (tiredness), swelling of the feet and shortness of breath. Most side effects are mild. However, you should discuss any unexpected effects you notice with your doctor.
- Keep CARDURA® and all medicines out of the reach of children.

FOR MORE INFORMATION ABOUT CARDURA® AND BPH TALK WITH YOUR DOCTOR, NURSE, PHARMACIST OR OTHER HEALTH CARE PROVIDER.

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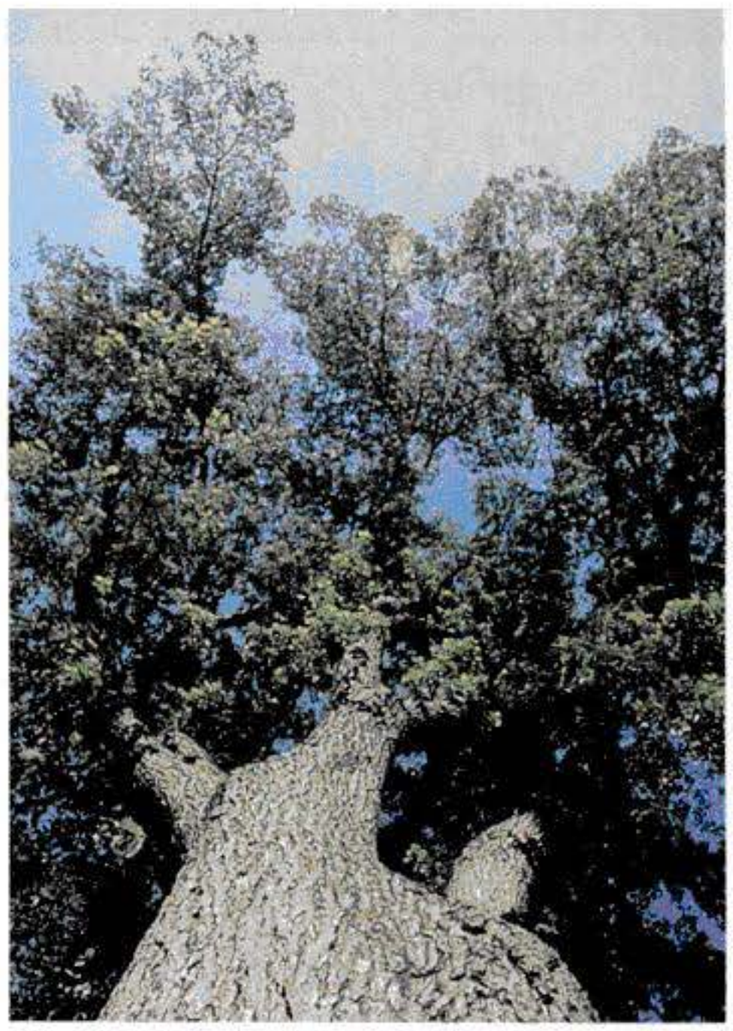
PLANTS

A Second Chance for Elms

AFTER TWO DECADES, geneticist Alden Townsend and colleagues at the Agricultural Research Service have found two varieties of American elm trees that could replace those ravaged by Dutch Elm Disease.

To find trees with a natural resistance to the disease, "we scoured the countryside," says Townsend. Then the researchers made cuttings, grew them for three to four years, inoculated them with the fungus, and watched for symptoms. Two varieties proved to be just what the gardener ordered: Valley Forge and New Harmony, expected to be commercially available by 1999. Though neither is completely immune to Dutch Elm Disease, both have a high tolerance.



Could sights like this become common again?

To prevent another blight, gardeners are cautioned to strive for diversity. When lining a street with elms, plant Asian or European varieties between American elms. Make sure the American trees are spaced at least 200 yards apart to prevent infection from spreading through the roots.—*Erica Garcia*

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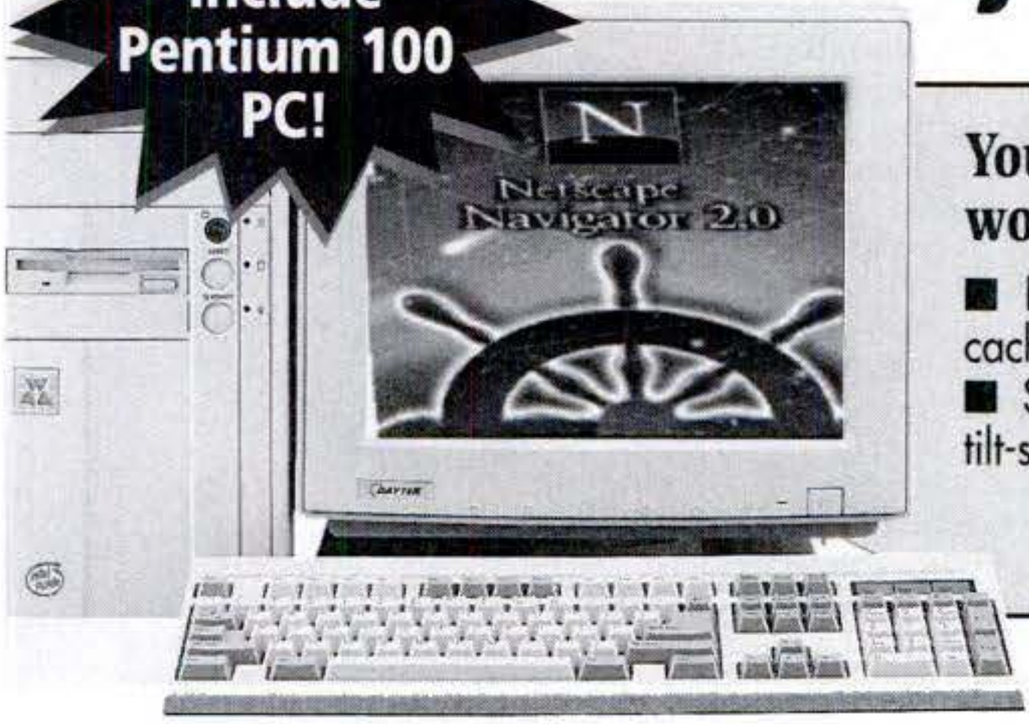
All courses include Pentium 100 PC!



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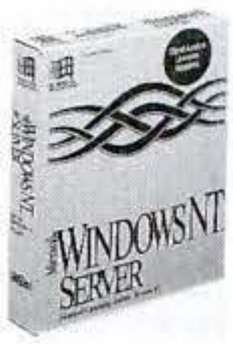
Choose the course that interests you, then send for your FREE catalog today!

Networking with Windows NT — Learn how to set up and maintain LANs and WANs for today's busy offices. NRI's course covers every phase of the process, from analyzing system requirements to troubleshooting.



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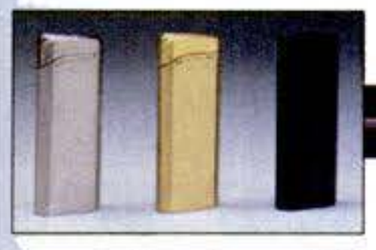
Will your next $100 dollars be real?

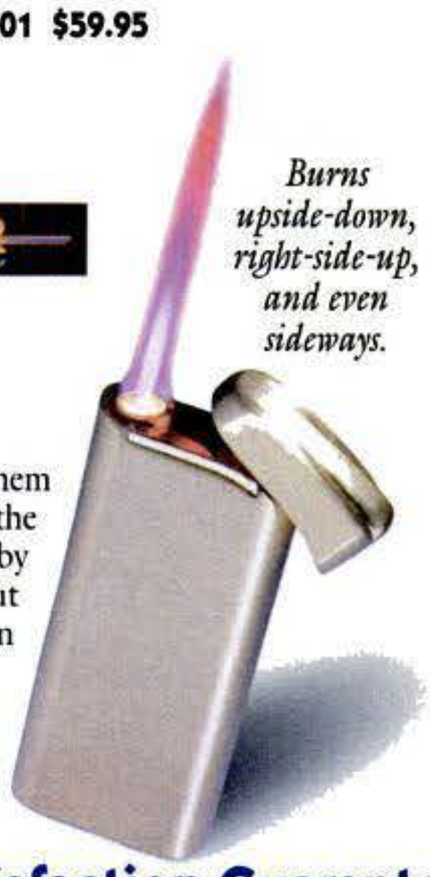
The U.S. Treasury recently announced that the country is being flooded with bogus bills – from Iranian-made U.S. twenties to home-made and near perfect "super hundreds". Larger banks can spot them. You get burned. Arm yourself with defense, or you could lose thousands.

New Money Lab™ has a 3-way hi-tech inspection system, nails phonies instantly! Place a bill in the UV slot – U.S. or foreign. Automatically the bill is scanned for fluorescence. Bogus gets a loud buzzer. Next, magnetic inks are read. OK gets a green lamp. Third test looks for water marks and the invisible metal lines in our currency and others. Takes just seconds. Now bring your cash to the bank with confidence. Measures just 9" x 7" x 5" – excellent for store counters, too.

- **Money Lab™ Counterfeit Detector, #CML-2001 $59.95**



LASER WINDPROOF



Burns upside-down, right-side-up, and even sideways.

New Laser Lighters burn blue to crimson – in any position.

Next time someone asks for a light, surprise them with the new Laser lighter. Instead of just blue, the jet flame turns a vivid crimson. Everyone nearby will ask you where they can get one, too. But don't sell them yours. We've only got a few. In elegant silver, black, or gold. Call now.

- **Laser Multi-Flame Jet Lighter #JF-S, JF-B, or JF-G $24.95**

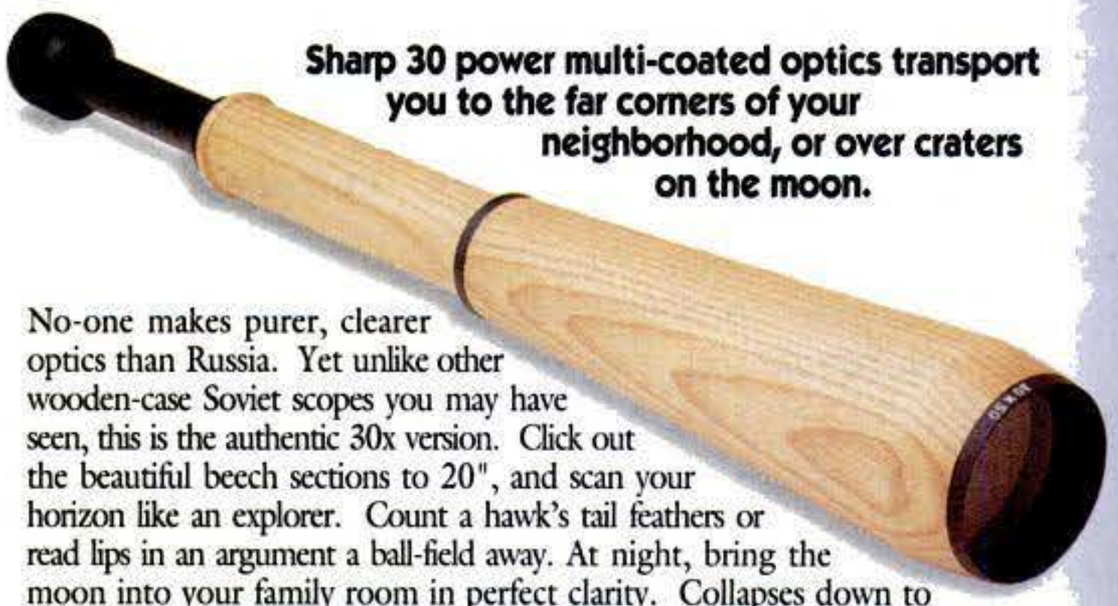
Each refillable, in a black vinyl case.

In the year 2010, your neighbors will own these binoculars, too.

You hear a noise outside, but see only darkness. Now pick up the new Raptor Tactical Night Vision Binoculars. Like science fiction, your yard is instantly transformed to green hued clarity. Pick out every leaf, every animal, four-legged or otherwise. Excellent for security, nature study, night work, law enforcement, hunting, or just scoping your own neighborhood. Built-in illuminator broadcasts invisible waves only Raptor can see – you view even in total darkness! Hi-tech ergonomic design puts all controls at your fingertips. Measures just 6¼" x 4" x 3", with 3.2x magnification, and up to 30,000x light amplification. Runs up to 100 hours on just one 3v lithium battery. Try them yourself, and see the future of night vision. You won't believe your eyes.

- **Raptor Tactical NV Binoculars, #NZT-21 ~~$599.00~~ Introductory Price $499.00**

13° field-of-view. ±4 diopters adjusts for eye-glass wearers. Weight, 3.2 lbs. Restricted technology – sorry no foreign sales.



Sharp 30 power multi-coated optics transport you to the far corners of your neighborhood, or over craters on the moon.

No-one makes purer, clearer optics than Russia. Yet unlike other wooden-case Soviet scopes you may have seen, this is the authentic 30x version. Click out the beautiful beech sections to 20", and scan your horizon like an explorer. Count a hawk's tail feathers or read lips in an argument a ball-field away. At night, bring the moon into your family room in perfect clarity. Collapses down to just 10" for transport anywhere, in its own black case. From Russia, where the crafting of fine optics is an art unto itself.

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They're really going to build it!

Fully detailed, in die-cast metal 1:18 scale, with working doors, hood, detailed engine and interior. About 10".

Ever since the '94 New York Auto Show it's been standing room only. Just for a glimpse of this true retro road-rocket. Now it's no longer a concept! The Plymouth Prowler. Soon to be introduced by Chrysler. So hot that orders are already flooding sales offices. Part batmobile, part pavement-chomping street roadster. Yet sleek as a cat. Ours is true to the blueprint, right down to mag wheels, flying bumperettes, and Candy Magenta paint. Race it around your desk, while you wait for your dealer to deliver your real one.

- **The Plymouth Prowler Factory Street Rod. #7394DO $44.95**

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Make your point at light speed.

The Bullet Laser is brighter, more compact, and more powerful than ever. With next-generation diodes, electronics and crystal optics. Project a vivid ruby dot up to 300 yards away, even in daylight. Great for meetings, job sites, driving the neighbors crazy, or watching pets run up walls. Class III certification meets all safety standards. Long-life powered by one AAA battery, included. Get the edge in real laser power.

■ **Bullet Laser.** An astonishing breakthrough in laser sizing technology, just 2¼" small! Click your keys to the included snap ring.
#4015 silver, #4016 black, $59.95 each.

Powerful and ingenious Edge Tactical One-Hander is unlike any other knife you will own.

Roll your thumb and expose a drop-point blade of 440A stainless – hollow ground and scalpel sharp. An adjustable double-disc pivot screw allows for complete blade speed control. Compress the strategic locking device – just as quickly your blade is closed.

The lean profile of The Edge Tactical One-Hander is *less than 1/4"*. Each is machined and milled from a solid bar of pure chromium spring steel. When the unknowns of work, sport, or emergency demand fast one-handed performance, there is no tougher knife.

■ **Edge Tactical One-Hander #7004 $39.95**

■ **Edge Tactical Gator-Edge #7005 $39.95**

SPECIFICATIONS

EDGE TACTICAL ONE-HANDER #7004/7005

Length Open: 7"/18cm	Handle: 420 Cr Spring Steel
Length Closed: 4"/10cm	Blade: 440A/R57-59
Weight: 2.4oz/67.2g	Blade Length: 3"/7.5cm

Sorry, Mr. Jones is not in. This is Lucille, his secretary, may I help you?

New micro-size voice disguiser even works with pay phones.

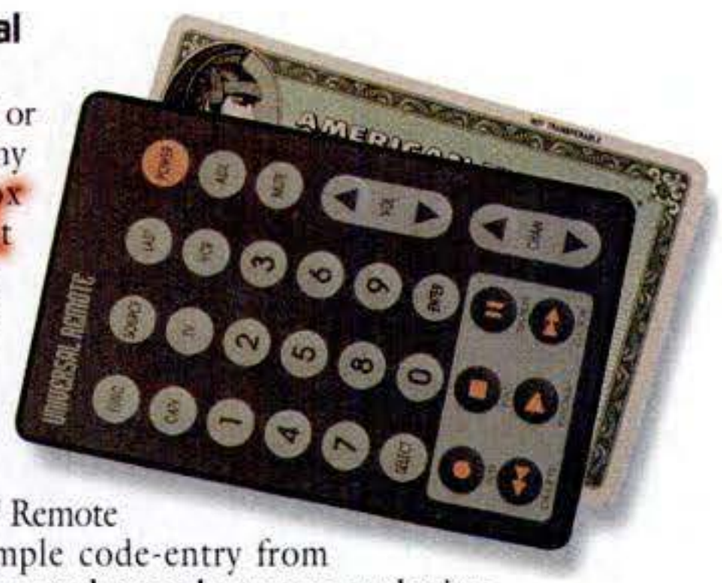
Here's just some of the things you can do with our new palm-sized voice changer: fool your friends, confuse your enemies, be your own secretary, make anonymous calls for business or security reasons, or protect women and children home alone.

Unlike desk-top voice-changers, the Micro-Disguiser has no modular hook-ups! Slip it from your pocket and place it over any pay-phone's mouth piece! Miniature electronics alter your voice through three scales, high to low. Extreme settings sound hilarious, and mid-range will even fool your own mother. Try one!

■ **Shirt Pocket Micro Voice-Disguiser #VC-168 $39.95**

Get one for your wife, too, and let harrassing callers think a man is at home.

World's smallest universal remote control.



Slip it from your wallet or shirt pocket and control any TV, VCR, or cable box anywhere you roam. At home, clear out your big clumsy remotes. Replace them with one wafer-thin unit. On the road, never have to figure out a hotel room's electronics. The 4-in-1 brain of the new Sliver™ Remote is pre-programmed for simple code-entry from included brand list. Even beeps to let you know you are keying properly. Included lithium battery lasts up to 3 years.

■ **The Sliver™ wafer-thin Universal Remote #RC-2510 $29.95.**

New Tele-Streak keeps your calls private. And more.

If during a phone conversation the green light goes out, someone has activated a tap or picked up an extension. Press the red button to resume talking, now with caution. When Tele-Streak is installed on all your extensions, the extension you pick up *automatically disconnects the others!* No fax or modem interruptions. No more running to turn off the answering machine. LED also tells you – before you pick up – if the line is in use. Measures just 3½" x 2" x 1" and requires no batteries.

■ **Tele-Streak Privacy Module #TRK-1000 ~~$39.95~~ $29.95!**

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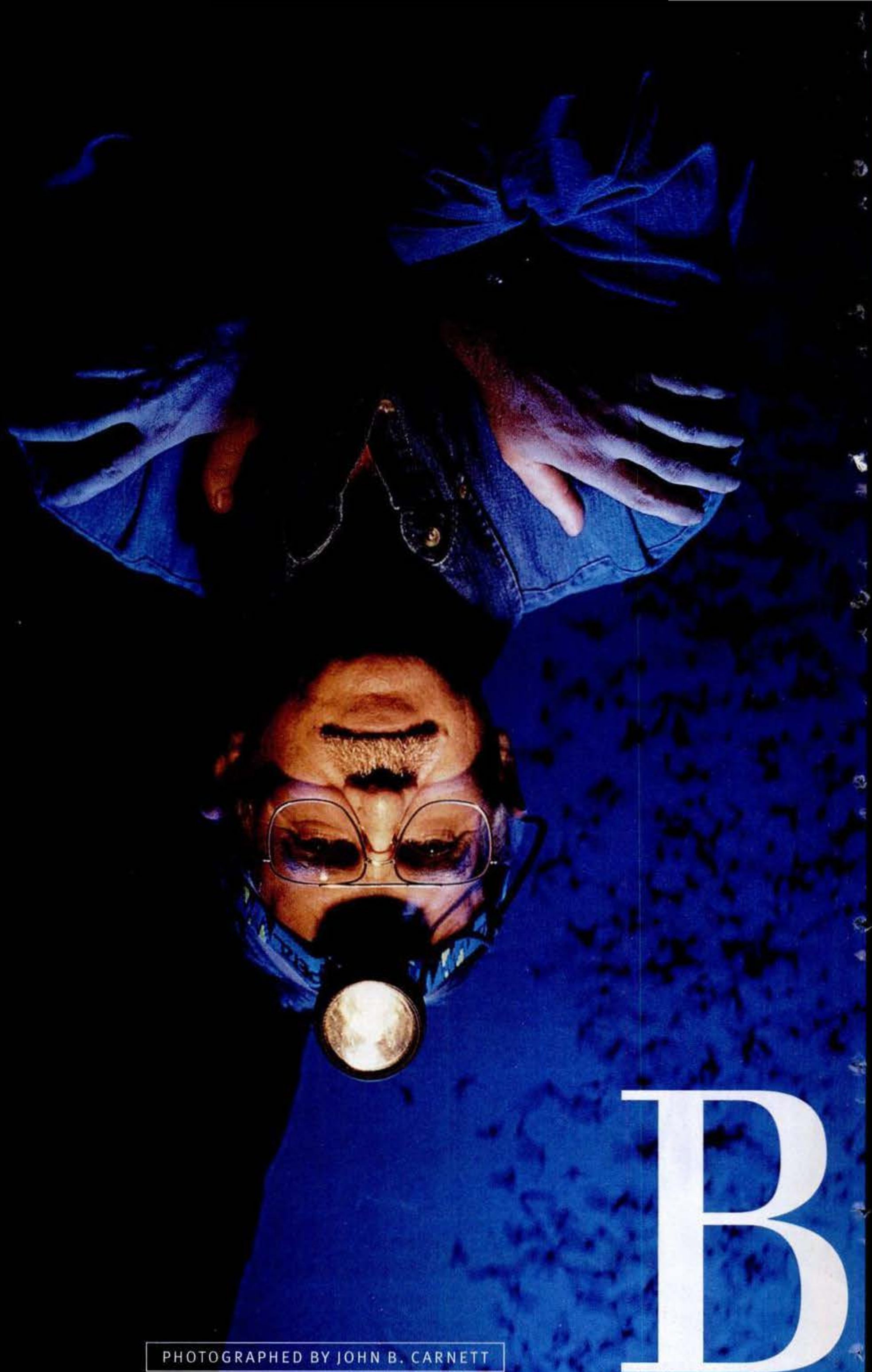
Merlin Tuttle, the founder of Bat Conservation International, has changed the way Americans feel about things that go bump in the night.



PHOTOGRAPHED BY JOHN B. CARNETT

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BACKGROUND PHOTO COURTESY OF MERLIN D. TUTTLE/BCI. BOTTOM: M. D. TUTTLE/BCI

Bats are getting a bad rap, says Merlin Tuttle, Texas ecologist. He's even persuading us that they might be our best friend.

batman!

SOME 20 MILES FROM downtown San Antonio, up a powder-dust road and across a series of barbed-wire fences crisscrossing Texas hill-country scrub, is the world's largest concentration of warm-blooded animals: a colony of some 20 million Mexican free-tail bats. They live in the 600-foot-long, 130-foot-deep Bracken Cave.

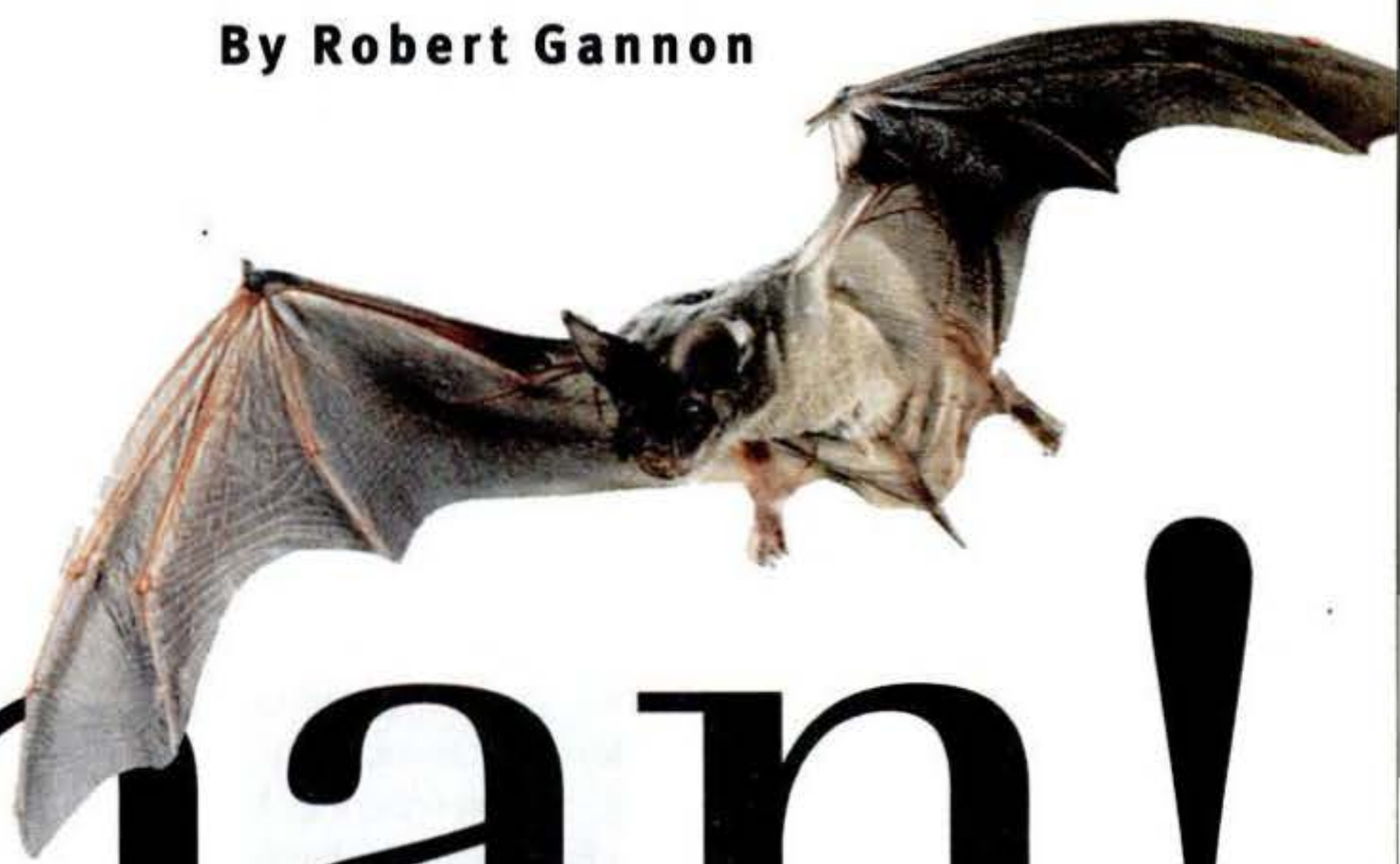
Merlin Tuttle and I are sitting amid wild persimmons and cactus a short distance from the cave's entrance, a funnel-like sinkhole. In a starched white shirt, gold-rimmed glasses, and pressed pants, Tuttle seems out of place among the limestone boulders and prickly plants.

The breeze has died with the setting sun. Suddenly, in the recesses of the opening, a flicker of movement. A bat flutters out, and another, and then thousands are swirling up and around in a counterclockwise maelstrom. Bat wingtips flap against each other, making an intense clicking sound.

One group oscillates off into the distance, while another congregates. In San Antonio, National Weather Service employees are watching sinuous columns of bats, some stretching as high as 10,000 feet, on their radar screens.

Tomorrow morning, the bats will return in flocks of 50,000 or so, each circling in a mile-wide holding pattern thousands of feet up, waiting their turn to reenter the cave. Then they'll dive, head to tail at 80 mph, wings held open only enough to steer, descending with such exquisite timing that

By Robert Gannon



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at a hundred yards above the entrance they'll look like a black waterfall. Then, at precisely the right moment, they'll spread their wings, slow to a glide, and zero in on their pups inside by listening for the distinct sounds of the pups' voices.

His blond hair blowing, Tuttle now strides into the cauldron. Suddenly his hand shoots above his head. "Got it," he says matter-of-factly, plucking a bat out of the air. He holds it gently, tenderly. He smiles at it. He likes bats, all bats.

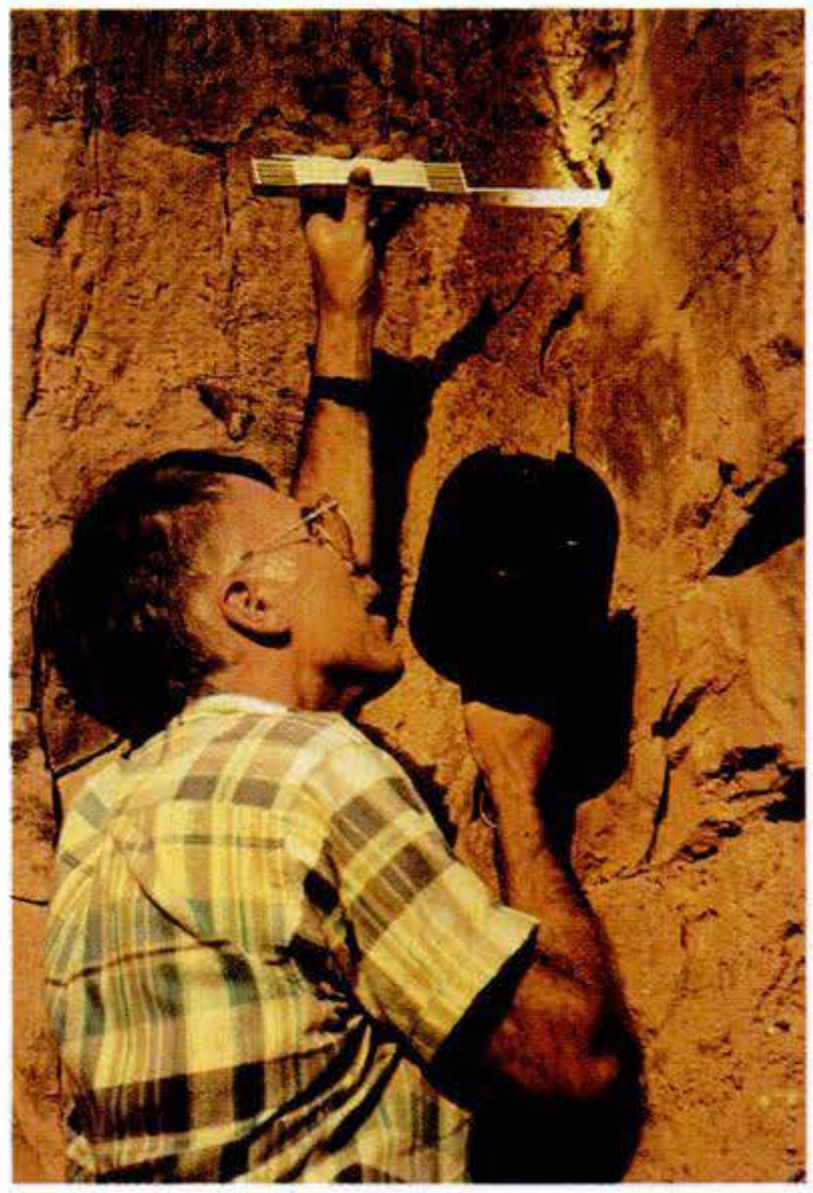
The 54-year-old Tuttle has been called the world's premier bat spokesman. In not much more than a decade, he has almost single-handedly changed America's attitude toward bats. Consider:

- Ten years ago, Texas was working on methods to exclude bats from highway bridges. Now engineers at the state's Department of Transportation are studying ways to make bridges bat-friendly.
- Killing bats used to be a good way for exterminators to make money. Today they're working with biologists to relocate unwanted bats from attics to backyard boxes.
- And if you're an average American, your attitude has changed too. Says Sue Barnard, a curator at Zoo Atlanta: "When I first came here in 1982, 80 percent of the phone calls I got about bats were those of panic: 'I have children, and there's a bat in my attic!' Now 80 percent are from people who want to attract bats: 'Where should I put my bat house?'"

And it's all because of Merlin Tuttle, says Barnard. "He is the driving force behind it all—absolutely."

Tuttle has radically altered the public image of bats through a relentless pursuit of scientific facts to back up his argument that bats are hugely more important—ecologically and economically—than most people imagine. His work is all coordinated through Bat Conservation International, a 14-year-old organization with more than 14,000 zealous members in 55 countries, founded and directed by Tuttle and headquartered in Austin, Texas. Environmentalists call the city America's Bat Capital. One reason is Tuttle. Another is the Congress Avenue Bridge in downtown Austin.

DONNA HENSLEY, BCI



Tuttle uses a light and measuring stick to study a crevice occupied by roosting bats inside a cave.

When the bridge was modernized in the early 1980s, new construction components left long slits underneath, an inch or so wide. That's an ideal space for bats. The result was headlined in the local newspaper: "Mass Fear in the Air as Bats Invade Austin." But within a decade, opinion had so changed that the paper built an observation area, Mayor Bruce Todd proclaimed Bat Awareness Day, and students from Travis Heights Elementary school wrote and performed "Hail, Hail, the Noble Bat."

Dusk. I sit on the river bank beneath the bridge, waiting. Gradually, others arrive: newlyweds, old women in wheelchairs, joggers resting, families spreading blankets, visitors from Osaka, Frankfurt, Khartoum. Sightseers cruise by in a boat. One tourist from Syracuse says, "I can't believe I'm out here to look at bats."

Down away from the traffic, in a faint aroma reminiscent of August barns, you can hear the chirpy squeaks of eager bats. They are preparing for what biologists call an "emergence."

In the dying sunlight, the Colorado River turns from vermilion to olive, and the sky changes to eggplant purple. Suddenly, the bats are here, flowing like smoke, like locusts, like swarming bees. Black ribbons snake off across the horizon.

The bats are heading out at an average 25 mph—twice the speed they must maintain to stay aloft, and half what they can reach in level flight. They fly out over a 10,000-square-mile area centered around Austin. If the bats were clearly visible in the dim light, residents would be astonished at the number. There are more than a million bats living beneath the Congress Avenue Bridge—the largest population of bridge-roosting bats in the world.

The bats will eat nearly their body weight in insects before dawn drives them home. They prey on migrating moths, blood-sucking mosquitoes, crop-eating pests. The bats of Bracken Cave alone can eat 250 tons of insects in a single midsummer night. And that, perhaps more than any other reason, is why Americans have finally developed an appreciation for bats.

"It's amazing how public opinion has changed over the years," says Brian Keeley, a wildlife biologist who works with Tuttle at Bat Conservation International. "The old conservation movement concentrated on animals that were cute, cuddly, or charismatic. Bats weren't perceived that way, so nobody was looking out for them. In fact, when Merlin was first establishing BCI, people from the Texas Department of Transportation were using blowtorches to kill bats by the thousands. Now they're cosponsoring our studies."

In his surveys of some 800 Texas bridges, Keeley has found that if conditions are right, a bridge has a 94 percent chance of being occupied by bats. Why are highway departments interested in housing bats? For one thing, says Keeley, it's good press: "Look at a new highway from a con-

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servationist's perspective. It's a big, black, greasy mark through a pristine habitat. Now, if you can show some benefits, that takes off the edge."

Bats aren't welcome under every bridge, of course. Nobody wants to install a guano factory over a parking lot. But bridge designers in Texas are encouraging bats to take up residence in most of their new bridges, and they're passing their experiences along to engineers in other states.

In southern states, bats typically migrate rather than hibernate. Those living in the Congress Avenue Bridge winter in caves in Mexico. There they mate, and return to Austin in March. In their uteruses, the females carry sperm held in suspended animation; they become pregnant after they settle back into their spring and summer home. They give birth to a single young each, an extraordinarily low reproductive rate, lower than any other small mammal. In late fall, they'll whiz south again on cold-front airstreams.

"Tell me about them," I had said to Tuttle as we started the two-hour drive south from Austin to Bracken Cave. He talked on the road, talked as we picked up supplies, talked as we hiked to the cave mouth, and talked through a dinner of hummus subs as we sat on a log. He may have talked through the night if dusk hadn't approached. (When bats are ready to emerge, they're bothered by human conversation.) Talking is Tuttle's job, having cast himself in the role of the world's foremost proponent of bats.

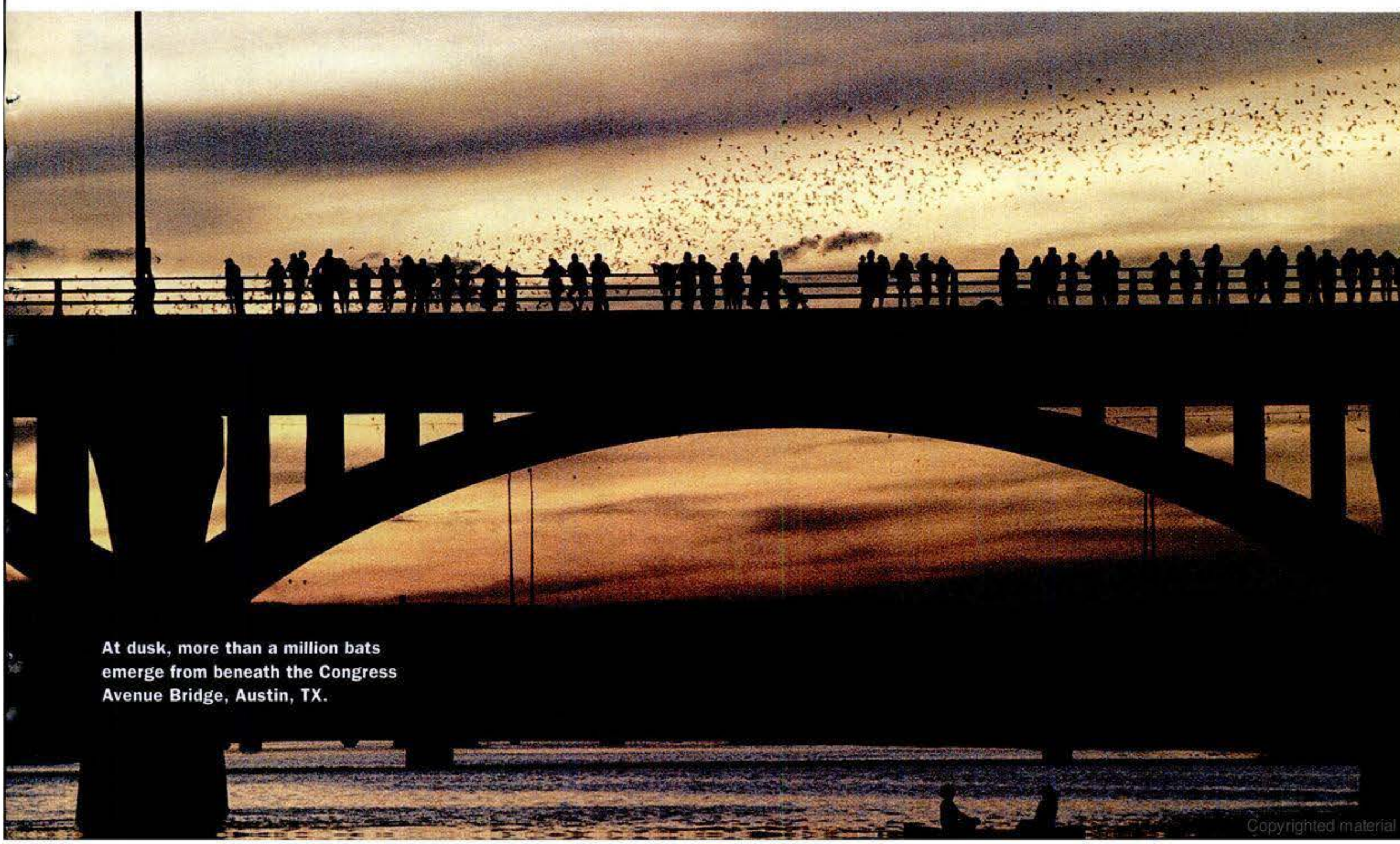
He's been talking about bats since he was a kid of nine, when he watched bats in an old miner's cabin and began taking notes. The fascination continued when his family moved to Knoxville, Tennessee, where he found a cave inhabited by gray bats, an endangered species. Through high school, he watched that colony, and he noticed a peculiarity: They didn't seem to be staying throughout the year, as his textbooks said they should. Instead, they seemed to migrate. On a trip to Washington with his parents, young Tuttle took his findings to experts at the Smithsonian. Surprised, they encouraged him to do some banding.

"And then I had a great bit of luck," he says. "That very winter, I found most of the bats that I had banded hibernating in a cave a hundred miles away." Eventually he banded more than 40,000 of them, and traced them as far as Florida.

Over the years, as Tuttle has studied more and more bat species, he has learned that none are dangerous or fearsome or unpredictable. While popular magazines were running stories with headlines like "Three Years of Terror—Real Life Ordeal" (about a family with bats in the attic), Tuttle was writing "Harmless, Beneficial Bats Still Get a Bum Rap." He became increasingly puzzled by the prejudice he found, and the astonishing volume of bad advice being circulated.

Tuttle vowed to counteract some of the worst myths about bats:

- Bats are blind. Actually, most have excellent vision. The California leaf-nosed bat, for instance, can see a caterpillar the size of a rice grain by starlight. "That's night vision on a par with our best military scopes," says Tuttle, "and I've had plenty of experience with those."
- Some are infected with rabies. True. But in the whole history of the United States, only 24 people are believed to have contracted rabies from bats, largely as a result of picking up a sick one. Although the little brown bat is the species most often found in American attics, not a single case of



At dusk, more than a million bats emerge from beneath the Congress Avenue Bridge, Austin, TX.

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Going Batty: A Sampler of Little Known Facts

OF THE 4,000 SPECIES of mammals in the world, more than 900 are bats. These nocturnal mammals inhabit most of earth's temperate and tropical regions; except for a few notable South American species that prefer blood, bats feed on insects, fruit, or nectar.
—compiled by Kal Island

Bats are the only true flying mammals. (The flying squirrel and flying lemur are actually gliding mammals.)

The first male mammals known to produce milk in the wild belong to a species of fruit bat. These male bats, while "normal" in every other way, have noticeable mammary glands and actually lactate. They were discovered in Malaysia in 1994.

During World War II, the U.S. Army developed Project X-Ray, in which Mexican free-tail bats had small incendiary devices strapped to their bellies. The bats were to have been dropped into enemy territory, where their bombs would explode while they roosted in Nazi-occupied buildings. The plan was scrapped after some of the bats escaped during field tests and took roost in the project's headquarters.

During the annual migration of Mexican free-tail bats, a local cruise line in Austin, Texas, offers a $110 honeymoon bat-viewing dinner.

The smallest bat is the butterfly bat, with a wingspan of barely an inch.

The bat with the largest wingspan—more than five feet—is the Bismarck flying fox.

Bats can hear frequencies as high as 212 kHz, compared with only 20 kHz for humans. From a distance of 16 feet, a big-eared pallid bat can hear the footfalls of an insect walking.

Vampire bats will feed on nothing but blood, even when they're starving. A vampire will routinely select one animal from a group and feed on it night after night. A vampire bat can consume its own weight in blood at each nightly feeding.

Vampire bats have also been known to prey on humans. An Argentine lumberjack was forced to quit his job because bats singled him out night after night, biting him on the face, head, and nose, even when he was among others in a large group.

In some bat species, such as *Myotis thysanodes* and *Myotis lucifugus*, adult females remain behind with a group of babies while other females forage for food. Sometimes this communal care includes suckling, with all females indiscriminately nursing all the young in the brood.

Female bats of the species *Pteropus rodricensis* have been seen helping other females give birth. The "midwife" licks and grooms the infant as it emerges from the mother. The midwife then helps the infant crawl to the mother's breast to feed.

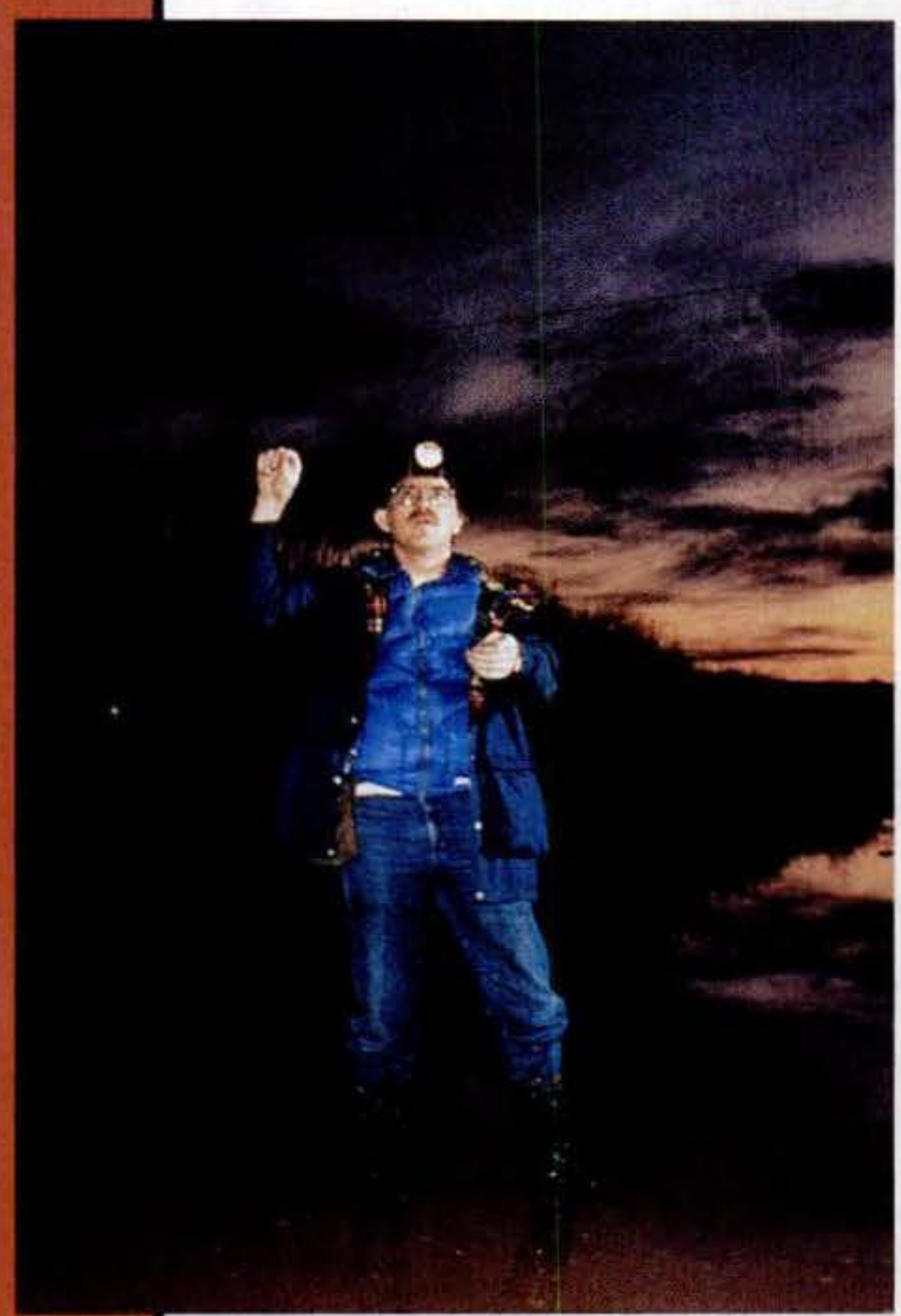
A bat fetus sometimes grows to one-third the weight of its mother—about the equivalent of a human mother giving birth to a 40-pound baby.

The heart rate of bats is higher than that of most other mammals, beating as many as 1,000 times per minute during flight. But while a bat is hibernating through the winter, its heart rate may drop to as low as 20 beats per minute.

this species transmitting rabies to a human has ever been documented.

• Some bats are vampires. That's true too, and it's a significant problem. But not in the United States. The three species of vampire bat (out of more than 900 worldwide) live only in Mexico and southward. They don't suck blood but slit the skin with razor-sharp teeth and lap the drip. Vampire bats are damaging to livestock, but ranchers rarely bother to differentiate between species, and routinely destroy whole colonies of beneficial bats (including some that migrate between the United States and Mexico) by burning tires in the entrances to caves that harbor bats.

• They're ugly. **Well, some are little gargoyles—partly because of their sonar equipment.** But most are not. The reason people think they're ugly, says Tuttle, is that when photographers snap a portrait, they often blow in the bat's face just before the shutter opens. The bat flinches, opens its mouth, and grimaces. To counter the practice, Tuttle has become a superb



DONNA HENSLEY/BAT CONSERVATION INTL.

Tuttle studies the movements of bats by trapping them in fine nets and banding them.

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photographer himself, portraying bats as they truly are. BCI now has a collection of 100,000 Tuttle photos and employs a full-time curator.

• Bats get tangled in hair. To debunk this bit of folklore, Tuttle sometimes tries to snarl a bat in a woman's hair. It immediately falls out.

Fear of bats, Tuttle says, comes primarily from our primordial fear of creatures of the night. Human beings are masters of the daytime world, but we don't do well—poor night vision and all—wandering the midnight woods, and we don't much trust animals that do. Waking up in the middle of the night with a presence in the bedroom—the *foof, foof, foof* of a bat trying to find his way out—only adds to our unease. (To remove a wayward bat, turn on the light and raise a window, and it will probably find its way out. If not, wait until it lands, then put a large, plastic bowl over it and slip a sheet of cardboard underneath. It's easier than it sounds.)

Tuttle also blames pest-control experts for giving bats a bad reputation. "While I was curator of mammals at the Milwaukee Public Museum 12 years ago," he recalls, "companies in that city were making fortunes by terrifying people about bats." But things have changed, and recently the pest-control industry's top journal, *Pest Management*, devoted almost an entire issue to articles explaining how valuable bats are, how to help people deal with troublesome bats without harming the creatures, and even how pest-control operators can help reverse the negative image of bats.

Meanwhile, health officials have realized that bats are usually harmless to humans. "One after another," says Tuttle, "the studies concluded that bats are no threat if left alone—in fact, they are highly beneficial, particularly to farmers."

Using carbon isotopes to examine the guano of Arizona free-tail bats, Hiroshi Mizutani of Tokyo's Mitsubishi Kasei Institute of Life Sciences found that two-thirds of their diet consists of crop pests. Meanwhile, other scientists have discovered that bats are important as plant pollinators. "Take away bats," says Tuttle, and you're asking for an awful lot of imbalance."

As of now, imbalance is where we're headed. Bats are disappearing worldwide, says Tuttle, and are now the most endangered land mammals of North America. Of the 44 U.S. species, more than half are endangered or are candidates for the list. At Carlsbad Cavern in New Mexico, for example, the bat population has plummeted from 8.7 million in the 1960s to less than a million today.

What's happening to them? Even with their newfound popularity, they're being excluded from large caves, killed by vandals (a few burning tires can wipe out a colony of millions), or inadvertently disturbed by cavers. Abandoned mines, sealed for safety, all too often keep out bats as well. Colorado alone reports that its Division of Wildlife has blocked some 2,000 mines. But many states now promote bat-friendly steel grates with slots large enough for bats to pass but narrow enough to keep people out. Nearly 200 such barriers have been installed in the last few years.

BCI and the U.S. Bureau of Mines recently agreed to research new designs that will maximize air flow, grate strength, and access for bats. Early grates obstructed air flow, altering temperatures enough that some bats rejected the mines.

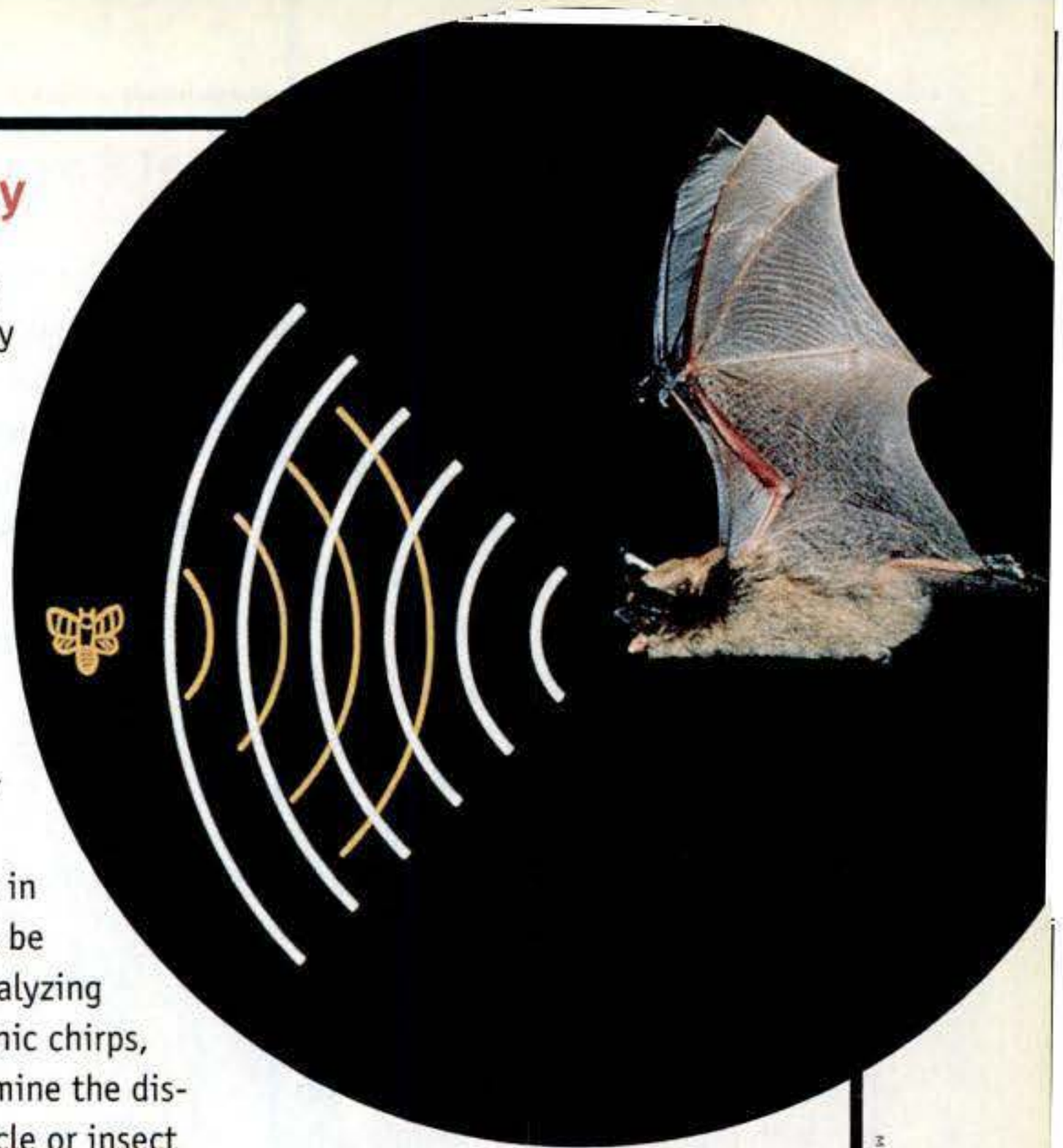
Protecting natural habitat such as the Bracken Cave is critical. I would have liked to have explored the cave, but it's more hospitable to bats than to people. The air is filled with ammonia—not from the decay of guano, but from the waste products of dermestid beetles and their larvae that live in the droppings produced by 270

Catch of the Day

SO FINE ARE their sonar systems that bats can fly through a dark room strung with threads without getting entangled—an experiment first performed 200 years ago. Bats find their way by emitting high-pitched chirps through their mouths or their nostrils. These sounds, which originate in the larynx, usually can't be heard by humans. By analyzing echoes from the ultrasonic chirps, bats can not only determine the distance to a nearby obstacle or insect prey, but also its size, shape, and direction of movement. This process is called echolocation.

The chirps speed up when the bat detects a likely meal, such as a moth or praying mantis. But the ears of some insects are tuned to the frequencies of bat voices. When a moth hears a bat coming, it may begin flying in crazy loops, or fold its wings to plummet into a bush.

Not all bats use echolocation. Because they have excellent senses of sight and smell, fruit-eating bats, for example, don't need sonar systems.
—*Kemba Johnson*



In a process called echolocation, bats bounce high-pitched sounds off moths and other insect prey to determine their locations and movements.

MERLIN D. TUTTLE/BAT CONSERVATION INTL.

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How to Build a Backyard Bat Box

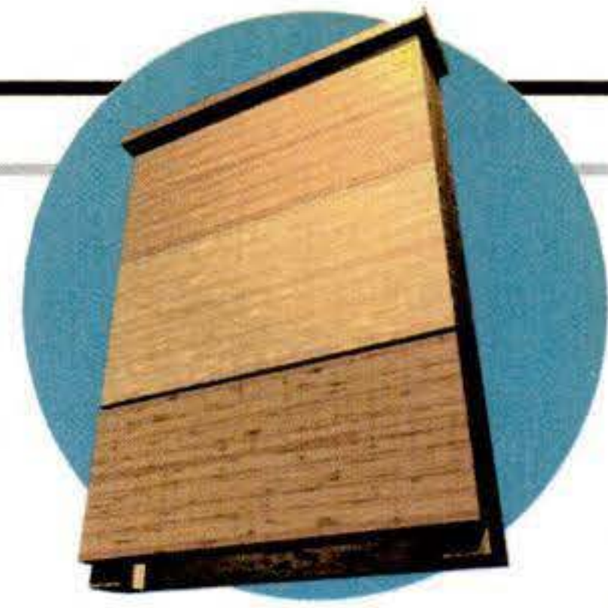
HOW DO YOU attract mosquito-eating bats to your yard? Build a bat house. The basic single-chamber house shown here will hold 30 to 40 bats. The 3/4-inch-wide entrance is the right size for most American species, and the 1 1/2-inch-wide interior allows plenty of room for roosting.

Use exterior-grade plywood to build the house, and caulk all cracks to eliminate drafts. Paint the outside of the bat house black or dark brown if you live in a Northern state, or a lighter color in the South. Roughen all interior roosting surfaces by cutting 1/8-inch-deep kerfs a half-inch apart. Or cover the interior surfaces with tightly stretched fiberglass (not metal) screening.

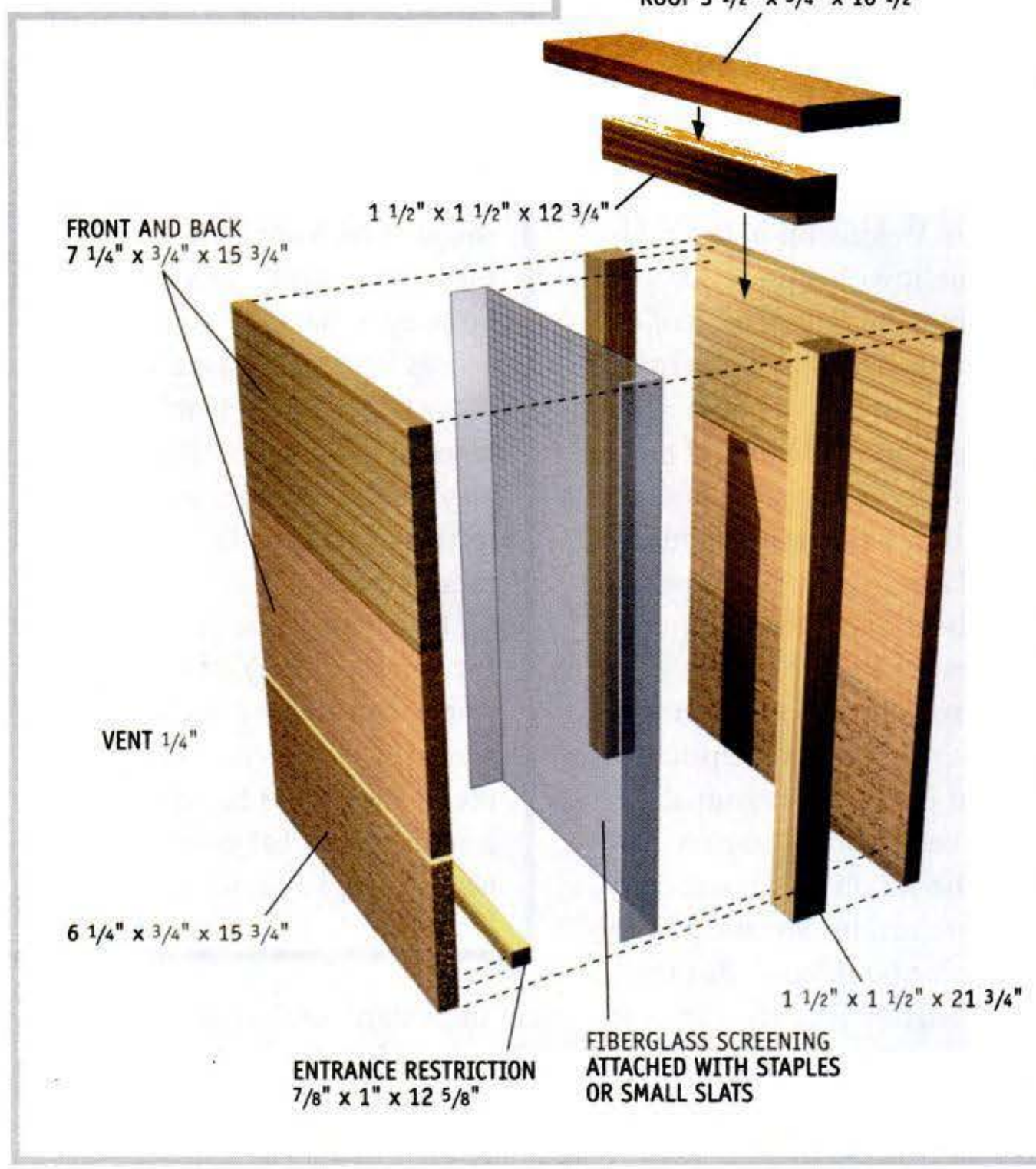
Proper placement is vital. Unlike birds, bats prefer a hot, humid, crowded place to raise their young. In Northern states, the best place for a bat house is in searing sunlight. Mount the house on a pole or the side of a building, out of reach of cats.

Bats may ignore the house for the first year. If they haven't moved in after two years, try a new location. Keep in mind that bats need a water source—such as a pond or brook—within a mile or two.

A handbook with plans for larger bat houses is available for $6.95 from Bat Conservation International (PO Box 162603, Austin, Texas 78716). Multiple-chamber models not only hold more bats but also enable bats to adapt to outdoor temperature changes by moving between chambers.—*R.G.*



ANDY CHRISTIE



tons of bats. "There's an almost incomprehensible number of those beetles," says Tuttle. "The guano is powdery, and as you walk across it you leave footprints. But behind you, [the prints] are disappearing because of all those moving critters." The dermestids eat living flesh too: If you were to pass out, they could reduce you to a skeleton in 24 hours.

The possibilities of passing out are not all that remote. In addition to the ammonia, there's the heat. Bats lining the walls at densities of up to 500 per square foot produce a lot of calories. Air temperatures can top 100 degrees.

Most dangerous, though, is the buildup of carbon dioxide from all those little lungs. The heavy bat breath settles, accumulating as the summer progresses. A human explorer who dipped his head into the carbon dioxide layer could quickly suffocate, as though he were holding his breath.

Although the largest colonies of bats live in caves and under bridges, smaller colonies often take up residence alongside humans. But attics, to which bats have been forced to adapt, are disappearing with tighter, insulated construction. To help replace lost habitat, **Americans by the thousands are putting up backyard boxes for bats,** with an enthusiasm once reserved for bluebird houses.

Unfortunately, Tuttle's work is not yet done. Millions of Americans still do not realize the value of bats. In Brielle, New Jersey, last year, Boy Scout Eric Miller asked the town council whether he could put up a few bat houses on 15-foot poles as part of his Eagle Scout project. The council turned him down. The project was killed by Brielle Board of Health President Terese Rizzi, who testified that the bats currently living in the local cemetery are quite enough. "The bats are living among the dead," she said, "and that is how we would like to keep it." ◆

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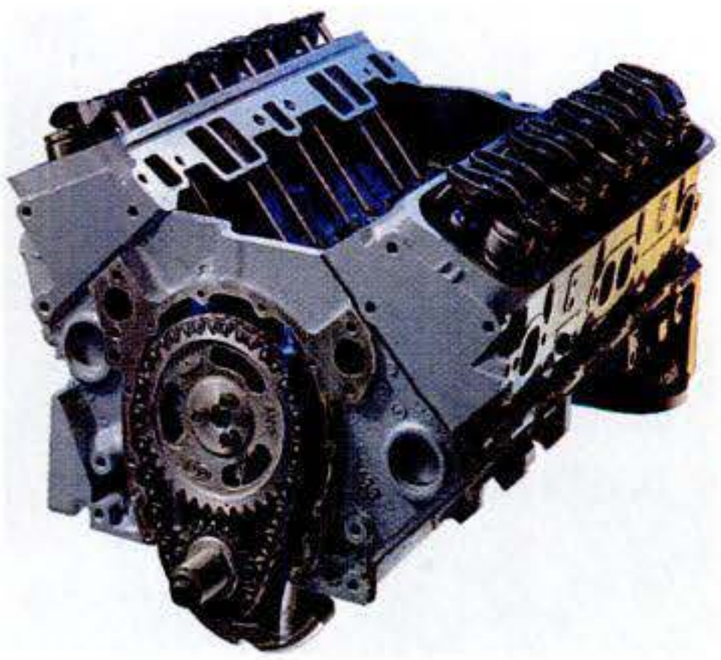

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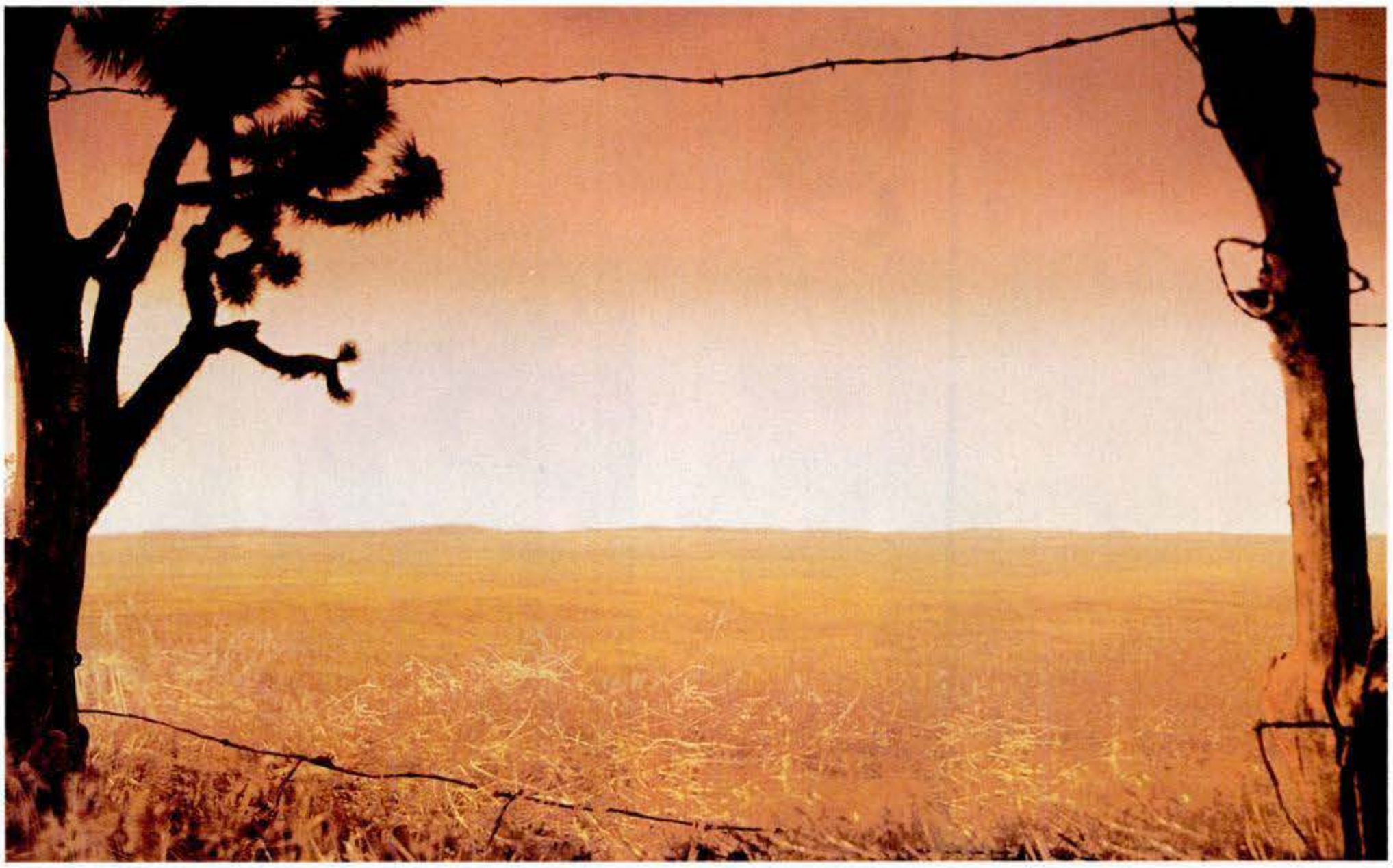

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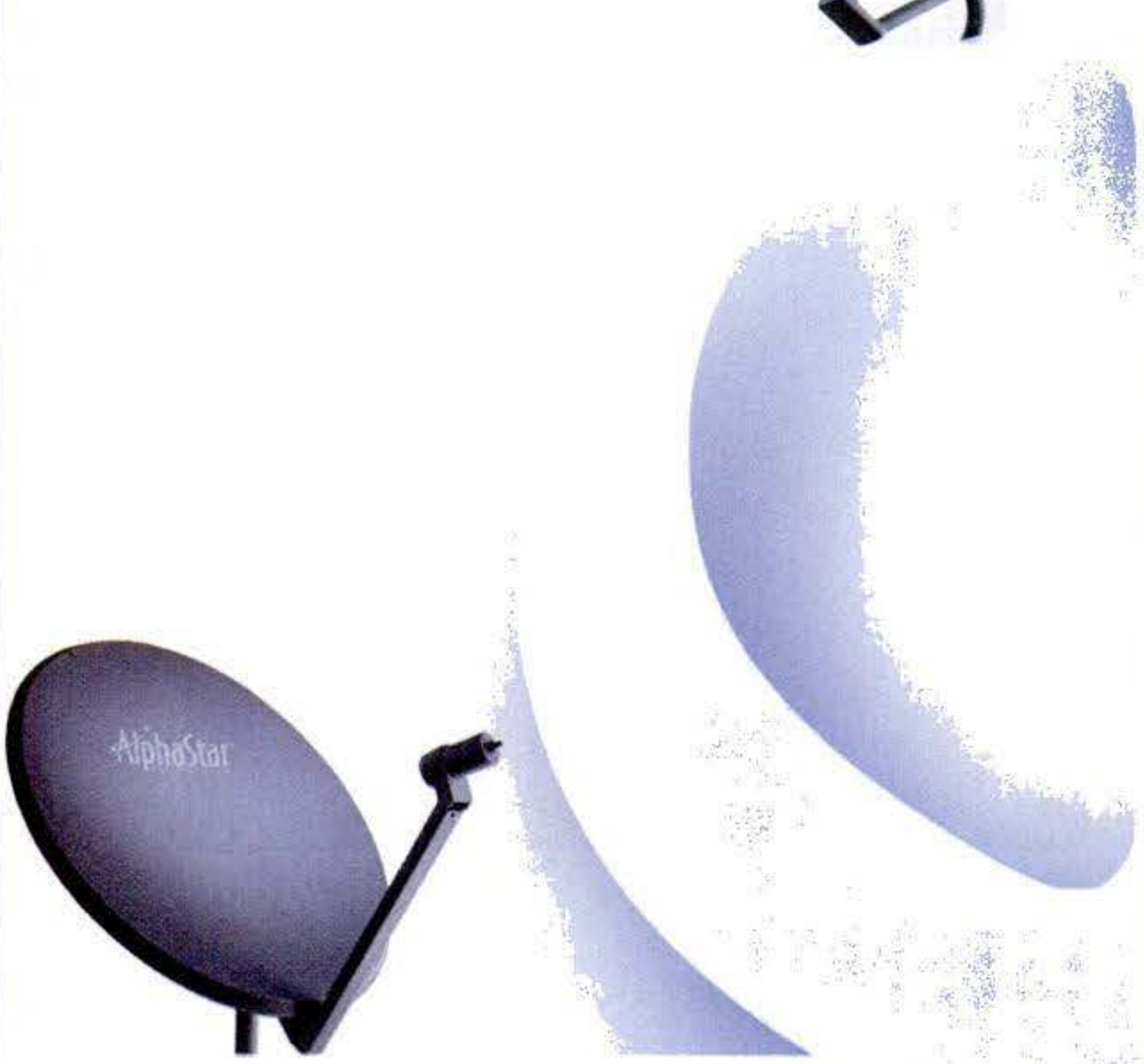

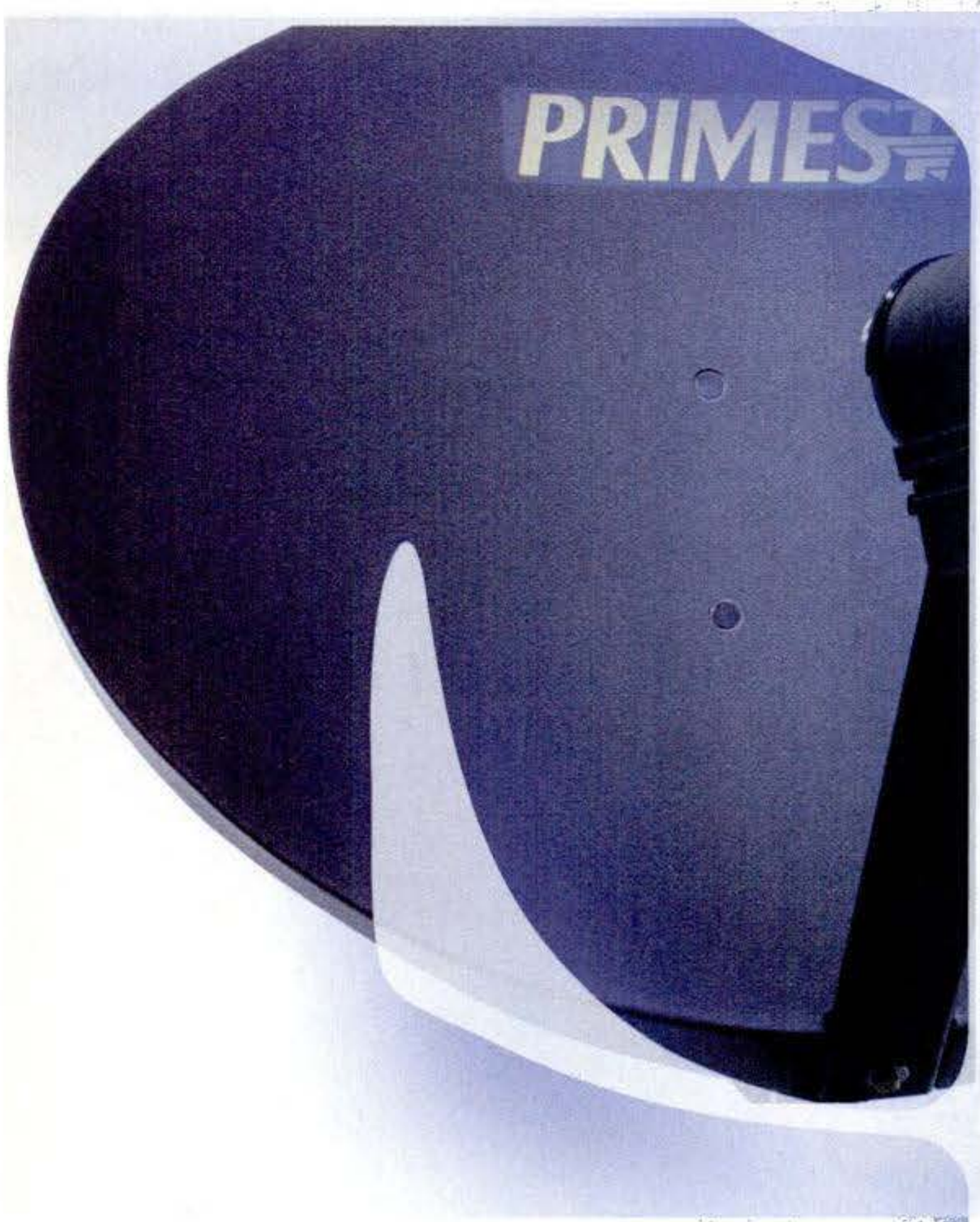

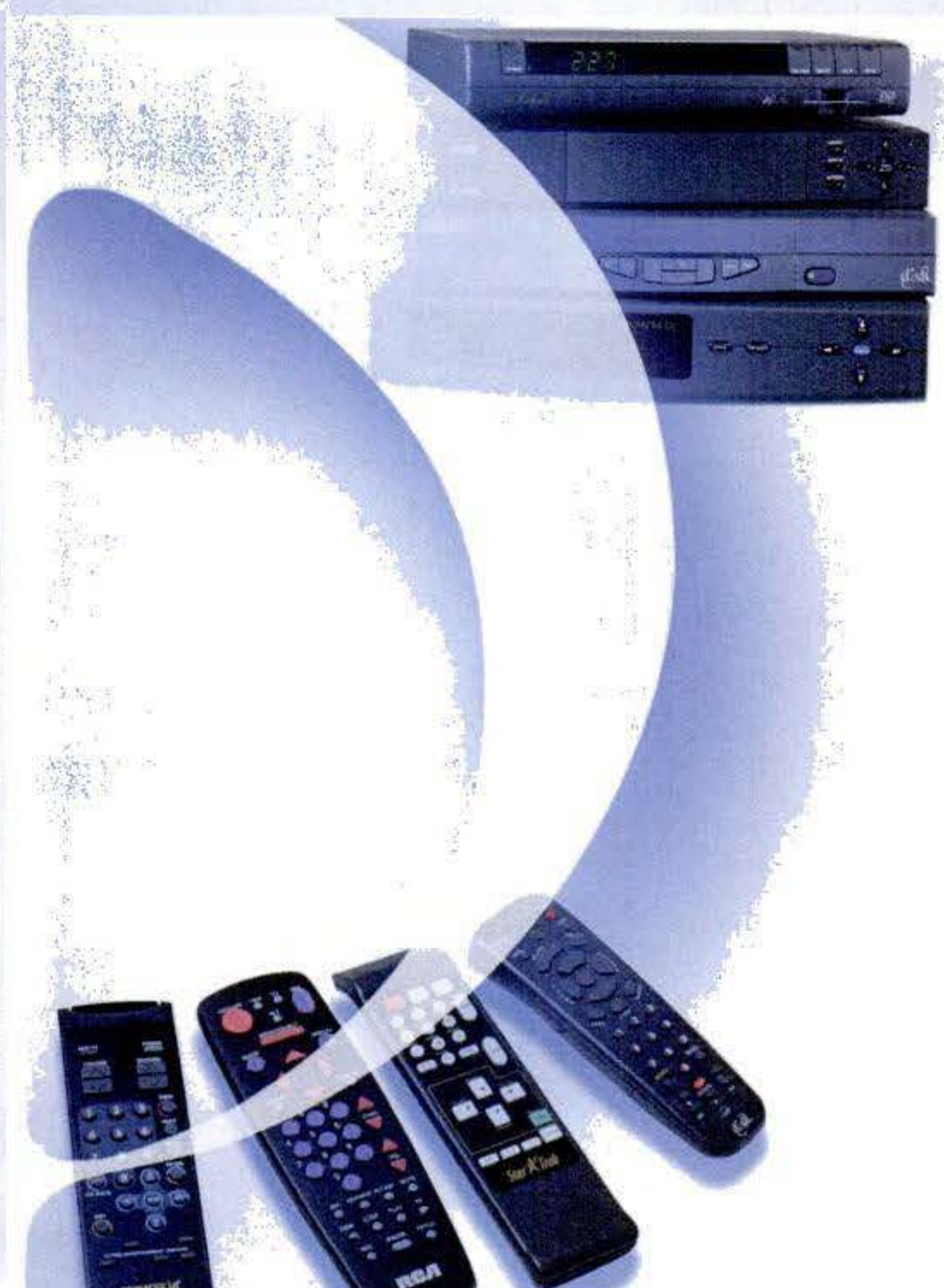

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Satellite TV Comes Down to Earth

Now anyone can afford a dish.

IF SATELLITE TV SOUNDS like an exotic, high-priced way to receive a television signal, then prepare for a shock. A proliferation of systems and brand names is driving down the price of satellite TV to very affordable levels. A basic system can now be bought for about the same price as a VCR—and may even go as low as $99.

By Stephen A. Booth

Keen as the competition among satellite TV purveyors is currently, it will become sharper still in the coming months, when 10 additional vendors begin hawking their hardware for receiving TV signals from space. A scorecard might help you tell the players, but you'll need more than equipment specs and prices to decide on a system.

Just over 5 percent of U.S. households now have some form of satellite TV reception, but the growth rate is astounding. Nearly 2 million homes acquired a dish in the last year, most homeowners opting for the relatively new DBS (direct broadcast satellite) hardware typified by PrimeStar's 36-inch dish and the 18-inch antenna of RCA's Digital Satellite System (DSS).

There is a great deal of appeal in a discrete DSS antenna that may be mounted just about anywhere to haul in 175 channels of digital-quality video and sound from high-powered Ku-band satellites. Unlike the older C-band antennas with their 10-foot girth, DBS antennas needn't be rotated to cherry-pick signals from a constellation of 23 low-powered satellites. Once locked onto the beam, DSS antennas remain stationary. This is also true of PrimeStar's new 27-inch and 36-inch dishes, which receive 95 channels from a medium-powered Ku-band bird.

Small-dish DSS now decorates some 2 million homes since becoming available two years ago. Most of the dishes bear the RCA brand of Thomson Consumer Electronics; they have recently been joined by Sony and Hughes Network Systems (HNS). Meanwhile PrimeStar, which primarily leases its equipment, picked up nearly a million of its customers in only the past year.

The rocket really got lit under DBS competition this summer, when EchoStar Communications launched its Dish Network at $199—along with the advance purchase of a $300 annual programming subscription. In no time flat, the

PHOTO-ILLUSTRATION BY RUSS WIDSTRAND

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How to Buy Satellite TV

FEATURES—NOT PERFORMANCE—differentiate the various DBS receiver models. For optimal satisfaction, until VCRs come with DBS tuner/decoders built-in, select a receiver that works in conjunction with a VCR.

Some models have an **(A)** EVENT TIMER that can be programmed both to turn the receiver on and to tune it to a preselected channel. You'd program a connected VCR separately to record over the same time frame.

Step-up receivers add **(B)** VCR CONTROL to the Event Timer. You program the receiver for time and channel; at show time, it sends an infrared signal to the VCR to begin recording.

Note too that some recent VCRs boast so-called DSS compatibility: They have tuner/timers that can be programmed for as many as 999 channels, and infrared repeaters that activate the receiver at recording time and tune it to the desired channel.

If you have one of these newer VCRs, you might not need VCR Control in your receiver. But top-shelf models tend to come with other desirable features. These include **(C)** MULTIROOM DISTRIBUTION—built-in (it's often available as an optional add-on kit).

This feature lets you run coaxial cable to route the satellite signal to TVs in other rooms. There, you assign an unused VHF frequency as the input channel for the DBS programming.

If you want to view different DBS channels at the same time—or think you might someday—make sure the antenna you buy now has **(D)** DUAL LNB OUTPUTS. Dishes packaged with some entry-level receivers have only a single LNB (low-noise block downconverter), but you'll need two to get independent, full-channel selection through a second receiver elsewhere in the home.—*S.A.B.*

DSS-FORMAT LICENSEES†

BRAND	MODEL	PRICE	FEATURES
Gen'l Electric	GS323G3	$699	A/B/D
	GS312G3	$599	A
HNS Insight	4342	N/A	A/B/D
	3342	N/A	A/D
Panasonic	TZ-DBS20	$600	A/B/D
	TZ-DBS10	$450	A
ProScan	PS84360	$699	A/B/C/D
RCA	DS7430RA	$649	A/B/C/D
	DS4430RA	$549	A/B/D
	DS3130RA*	$399	A
Samsung	DSB-1000	$749	A/B/D
Sony	SAS-AD2	$850	A/D
	SAS-BD2	$700	A/D
	SAS-BS2	$600	A
Toshiba	TSS-222	$650	A/B/D
	TSS-111	$499	A
Uniden	UDS 200	N/A	A/B/D
	UDS 100	N/A	A

INDEPENDENT DBS SERVICES

BRAND	MODEL	PRICE	FEATURES	PROGRAM SUBSCRIPTIONS
AlphaStar	Star Trak 1000	N/A	D	$25 to $50
Dish Network	Standard	$599**	D	$10 to $40
Dish Network	Premium	$749**	A/B/D	$10 to $40
PrimeStar	PrimeStar	***	A/B/D	$33 to $55

†Only receiver/antenna packages listed; some brands sell receivers separately. Data from Daewoo, Fisher, Hitachi, Philips not available at press time. Program subscriptions sold by DirectTV ($15 to $45) and USSB ($8 to $35).

*$200 cash-back offer from DirectTV through 12/31/96.

**$199 with advance purchase of $300 annual programming subscription.

***Equipment leased as part of subscription; $199 one-time installation charge.

company had 150,000 customers for its 18-inch DBS system, and had its DSS competitors scrambling to match the deal with their own rebates.

This slick bit of marketing is the brainchild of EchoStar founder Charles W. Ergen, an entrepreneurial veteran of satellite TV whose company dates back to the earliest days of the old C-band industry. You can expect additional aggressive promotions from EchoStar, because the company controls both the hardware and the programming it sells. RCA and the other suppliers of DSS hardware get subsidized by the programmers. Subscriptions for DSS programming are sold by DirecTV, a subsidiary of Hughes Electronics Corp. that owns the licenses for DSS technology, and by United States Satellite Broadcasting (USSB), a DirecTV licensee.

Besides Charlie Ergen's efforts to put a dish in every home, prospective satellite TV customers can expect bargains generated by competition among DSS licensees and from other DBS services.

As you read this, eight additional brands are joining the DSS camp—though splinter might be the better term. These include Daewoo, Fisher, Hitachi, Panasonic, Philips, Samsung, Toshiba, and Uniden. Their entry will greatly expand the 25,000 retail outlets for satellite TV gear. (Radio Shack now sells RCA's DSS as well as PrimeStar's system, and AT&T telemarkets RCA).

Yet another DBS entry comes from AlphaStar Digital Television, whose medium-powered Ku-band satellite will bring as many as 100 programming channels to 24-inch dishes (30- and 39-inch dishes for "fringe" areas—residents of Alaska and Hawaii distinctly not excluded!). AlphaStar is owned by Canada's Tee-Comm Electronics, a major manufacturer of satellite gear since 1983.

What attracts so many entities to a place in space?

Besides the **standard TV fare** of movies, sports, news, and sitcoms, DBS holds promise for other forms of software delivery.

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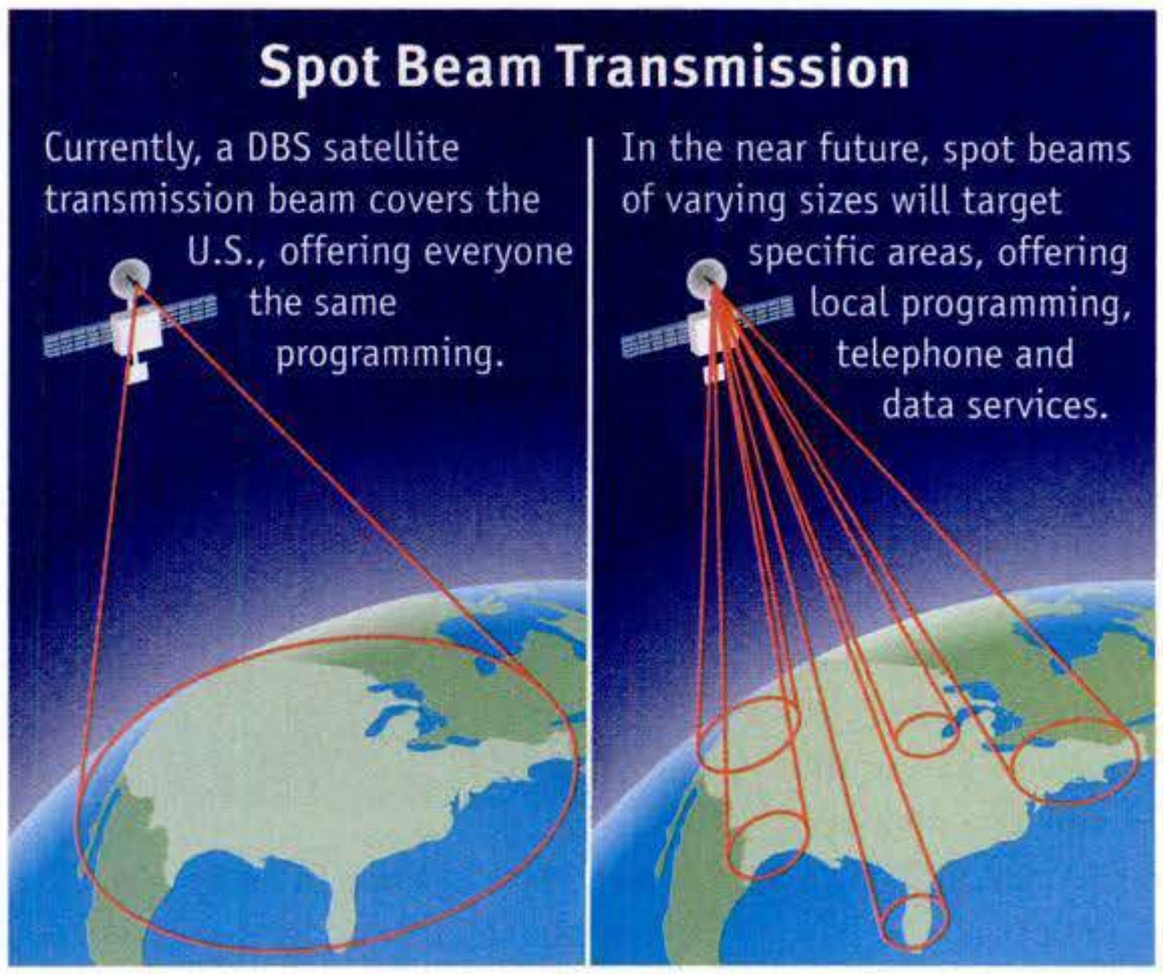
GREG WAKABAYASHI



Among them is the ability to download multimedia presentations from the Internet, at speeds much higher than via telephone or cable modems. Business-to-business and business-to-consumer applications also are envisioned. With all this potential, the technology's even gotten some attention from an unwanted quarter—signal pirates. This scourge to programmers and retailers only recently reared its ugly head in the DBS world.

Besides dish size and satellite channel capacity, subtle differences exist among the various DBS systems. These, however, are transparent—and probably irrelevant—to viewers. The method used to compress signals is one such difference. MPEG-2, a method of digital compression for video defined by the Motion Pictures Experts Group, is used by AlphaStar and EchoStar, as well as DSS programmers DirecTV and USSB. To MPEG-2, the latter two groups add proprietary coding and other features developed and licensed by DirecTV, while the others use an international standard called MPEG-2/DVB. PrimeStar doesn't employ "MPEG video" at all, but rather the DigiCipher 1 system. By sticking to the standard MPEG-2, AlphaStar and EchoStar say they can keep prices low because they pay no licensing fees to DirecTV and may obtain equipment from a wide variety of competitive sources.

Whatever their delivery method, all the DBS services look and sound great, particularly when compared with broadcast and cable television. What's probably more important to most viewers is the makeup and pricing of the programming—and this will become more important as hardware approaches commodity status.

Just about every desirable channel (HBO, Cinemax, or Disney, for example) is available through any of the DBS services. Essentially, these programs are "brands" and, like a Swanson's frozen dinner, are available for sale in any TV supermarket.

All things being equal, the tie-breaker among DBS services could be pay-per-view (PPV) programming: first-run movies, live concerts, and sports (either special events such as boxing matches, or season-long packages for league-wide access to all games in a given sport). USSB notes that 78 percent of its subscribers say they rent significantly fewer movies

Menus Plain and Fancy

ONSCREEN MENUS vary from one hardware manufacturer to another. For example, RCA, Sony, and Toshiba are all DSS systems with programming from DirecTV and USSB, but each "graphical user interface" looks different.

Here are some key points to check:

- How many clicks of the remote control are needed to tune a program?
- How many days in advance does the program guide cover?
- Can menus be viewed simultaneously while you watch a current program? If so, how much of the screen image remains in view?
- Does the menu offer "personal preference" settings?

Most new receivers feature single-touch tuning, either directly from the program guide or from a montage of channel logos. Some DSS brands offer StarSight Telecast's program guide for direct tuning.

Advance-schedule information is usually a function of receiver memory and the number of programming channels available. So RCA's receivers display information about the 175 DSS channels for 64 hours into the future. Meanwhile, the prelaunch version of AlphaStar's Voyager menu showed listings seven days in advance, arranged by category (for example, movies, sports, PPV)—which is also how its remote control is designed.

In one way or another, all DBS receivers offer some kind of user-programming, such as creating favorite-channel lists. Conversely, all provide channel lockout as a means of controlling access to objectionable programming or PPV shows. You can also set PPV spending limits. In the DSS receivers from Panasonic and RCA, profiles for different viewers can be memorized.—*S.A.B.*

Each satellite TV system features its own onscreen guide, but some are better than others.

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from video stores since getting PPV service by satellite.

At the moment, DSS providers DirecTV and USSB have the edge in PPV, with 40 to 60 channels earmarked for movies, plus a cornucopia of seasonal packages appealing to sports fans. At its launch, EchoStar offered six PPV movie slots, with 20 expected by year end. PrimeStar has 11 (including the adult-oriented Playboy Channel), and AlphaStar planned to offer 10 PPV slots at its launch.

Another differentiator among DBS providers might be the amount of local programming offered. Unlike cable TV operators, DBS is not now permitted to carry local, independent TV stations. Even access to the national networks is limited, owing to regulations designed to protect local network affiliates. But selected telecasts from the five networks (ABC, CBS, Fox, NBC, and PBS) can be viewed by DBS households in so-called "white areas," regions deemed to be under-served by terrestrial broadcasts, or where reception conditions are marginal or substandard. This is available through a monthly subscription (about $6) to the PrimeTime 24 service offered by DBS providers.

Recently, though, terrestrial broadcasters began demanding a more **strict accounting** from DBS carriers regarding who gets access to this uplink service. The point of contention is markets where broadcasts should be plentiful but signal interference reigns. This is a gray area that might be resolved in the future by new higher-tech satellites capable of spot-beam transmission.

Instead of projecting a signal over a wide geographic "footprint," multiple (as many as 500) beams can be narrowly focused at specific points on Earth. Consequently, it's possible that an independent station in Anytown, USA, might authorize a DBS service to carry its signal, for pinpoint retransmission to the local market where it has an FCC license to broadcast.

Moreover, the beams can be redirected, or allocated, to provide bandwidth-on-demand. For example, all the college football fanatics and alumni who can't scrape up any tickets to the Alabama-Tennessee game might book berths on a cruise ship and get a spot-beam transmission somewhere beyond the 12-mile limit in the Bermuda Triangle.

Spot-beam technology has other potential applications—perhaps the biggest being Internet access. Individual spot beams could be dedicated solely to World Wide Web traffic, for example. How this might be done is apparent from the workings of an existing DBS service now being used by business customers.

DirecPC, yet another subsidiary of Hughes Network Systems, has been delivering online services to businesses on a dedicated system via satellite for almost two years. The company is now on the verge of offering a system that would receive a television signal and a data signal via one dish, not two. Data signals come from the Galaxy 4 satellite which, DirecPC explains, is located close enough to DirecTV's DSS birds so that signals from both orbiting satellites could be received on a 21-inch antenna.

DirecPC's prototype dish has a unique feed-horn that picks up both the linearly polarized DirecPC signal and the circularly polarized DSS transmission. Dual LNBs (low-noise block downconverters) separate and route the traffic appropriately—to a DSS receiver at the TV and to a DirecPC card in the personal computer. The PC's phone modem has enough speed and bandwidth to send mouse-click commands upstream to DirecPC's server, for mach-speed return delivery of data-heavy Web content via broad-bandwidth satellite.

When can you expect to see this DBS hybrid? Possibly by the time you read this. Estimated cost? Somewhat more than the typical sticker for a dedicated DSS or DirecPC system—but less than the combined price for both.

Wiring for the information superhighway may not amount to much more than the few feet it takes to connect the dish to the receiver. ◆

Space Pirates

VIKTOR KOEN

IF YOU CURRENTLY own a DSS receiver, you've got pirates to thank for the brand new access card you probably received from DirecTV.

Resembling a credit card, the item slides into the front of your receiver. You probably haven't given it a thought since the day your system was installed. But it's always foremost on the minds of DSS program providers, because the card is key to the security system that prevents unauthorized reception of DirecTV and USSB signals.

On June 26, DirecTV and News Datacom filed civil suits against 22 members of an international piracy ring, charging them with attempts to compromise the DSS encryption system developed by Rupert Murdoch's News Datacom.

Canada is the prime market for the phony cards. DSS telecasts are not authorized in Canada, but the signal leaks over from the U.S. border. An estimated 150,000 Canadians have obtained DSS receivers and falsely registered them to addresses in the United States. When DirecTV discovers these "gray market" receivers, it deactivates the access card.

Subsequent to the security breach, DirecTV and News Datacom began replacing access cards in July and should complete the process this fall.—*S.A.B.*

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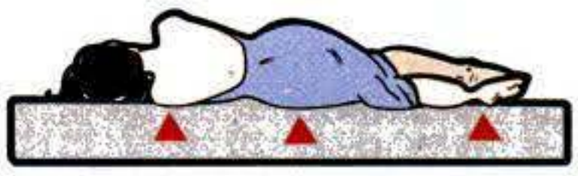

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Stealth Comanche

By Bill Sweetman

QUIET The Comanche's five-blade rotor makes a "whir" rather than the "whop-whop" of a two- or four-blade rotor. Not only is it quieter, but it blends into background noise better. By the time an enemy hears Comanche, it will be almost twice as close as today's helicopters.

The main rotor causes most helicopter noise. At low speeds, the Comanche's rotor slows for an ultra-quiet "sneak mode." An advanced airfoil prevents stalling. A shroud enclosing the Fantail eliminates the noisy mixing of wakes from the main and tail rotors.

WHEN THE BRITISH Army bought its first attack helicopters last year, one senior officer described the purchase—not entirely in jest—as the most important innovation in equipment since the horse. But the best is yet to come. Today's Apache helicopters will be succeeded by the Boeing-Sikorsky RAH-66 Comanche—the first stealth helicopter. With advanced electronics, the Comanche will penetrate enemy territory to scout and snipe at targets with missiles and cannon fire.

Comanche is also a model for future civilian helicopters. Its fly-by-wire controls and maneuverability will help pick up accident victims or business travelers from tight landing spots. The helicopter's low drag helps give it a long range—an important asset for rescue or transport. And the noise-muffling technology will be valuable whether the people on the ground are armed with lawyers and petitions or missiles.

A prototype flew in January, but it will be 10 years before Comanche enters service with the U.S. Army. The Army's priority is to modernize the larger Apache helicopter with the new Longbow radar-guided missile system, and it cannot afford to do that and produce Comanches at the same time.

Six more prototypes will come early next century. They will be evaluated for two years before the Army decides about full production. The frustration of Comanche's creators is tempered by their belief it will remain the best in 2006. "Nobody else," says one Army program manager, "is building a helicopter like this." ◆

STEALTH Radars can easily spot the squared-off shapes of regular helicopters. But Comanche's angles deflect radar. Engines hide behind V-shaped inlets. The tail looks like avant-garde sculpture, with the Fantail shroud and tailfin leaning in opposite directions. The Comanche's Hellfire antitank missiles and Stinger air-to-air missiles are carried on doors that swing up and out for firing or loading. The landing gear and three-barrel 20-millimeter gun retract into the body, and radar-absorbent shrouds cover the rotor-blade roots. Overall, the Comanche's radar image is 1/630 that of today's Apache attack helicopter.

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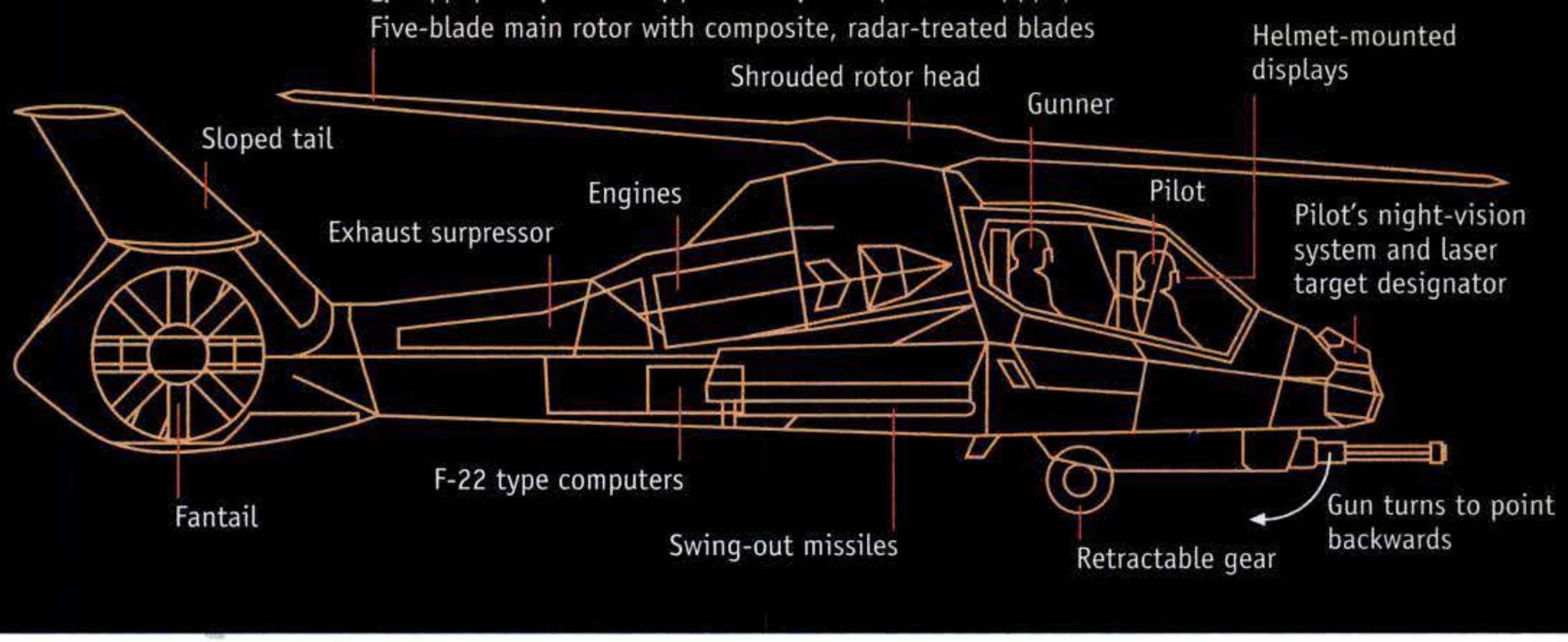

JOHN GRIMWADE

Easier One of the best things to come out of the Comanche may be its pair of Allison/Allied-Signal T800 engines. Each of the compact, 307-pound turbines delivers 1,200 horsepower. The T800's creators used computer-aided aerodynamic design to achieve high performance with a few rugged compressor and turbine stages, making the engine reliable and easy to repair. Almost any component that fails in the field can be removed and replaced with a single multipurpose tool.

Smarter The Comanche's pilot and gunner will wear virtual-reality helmets linked to nose-mounted sensors. Either crew member can choose between a starlight view (with low, natural lighting) or an advanced infrared sensor that highlights targets and penetrates smoke and haze. The infrared sensor has a 40 percent greater range than today's systems. Onboard computers—similar to those of the F-22 fighter—will scan the scene and help the crew identify priority targets, such as mobile missile launchers. Fly-by-wire controls will help the pilot exploit the Comanche's 200-mph top speed and its agility—it can swing its nose through 180 degrees in less than five seconds while hovering. Using a sophisticated autopilot, Comanche will be able to "unmask" from behind a hill, scan the battlefield with two sweeps of its sensor turret, and "remask" automatically, returning to its last position despite winds or turbulence. Out of enemy sight, the gunner can then plan the attack.

Cooler Attack helicopters fly so close to the ground that it's difficult for small, mobile radars to track them. Many anti-helicopter guns and missiles instead use infrared imagers to find targets, and infrared seekers to hit them. But detecting the Comanche's heat signature won't be easy. It's only about one-fifth the size of Apache's signature. To suppress position-revealing heat, the Comanche has a complex exhaust system that is built into its tail boom. Hot exhaust flows into long slits, where it mixes with the cool outside air that is drawn through the top of the boom. The mixture then blends almost instantly with the downwash that comes from the rotor.

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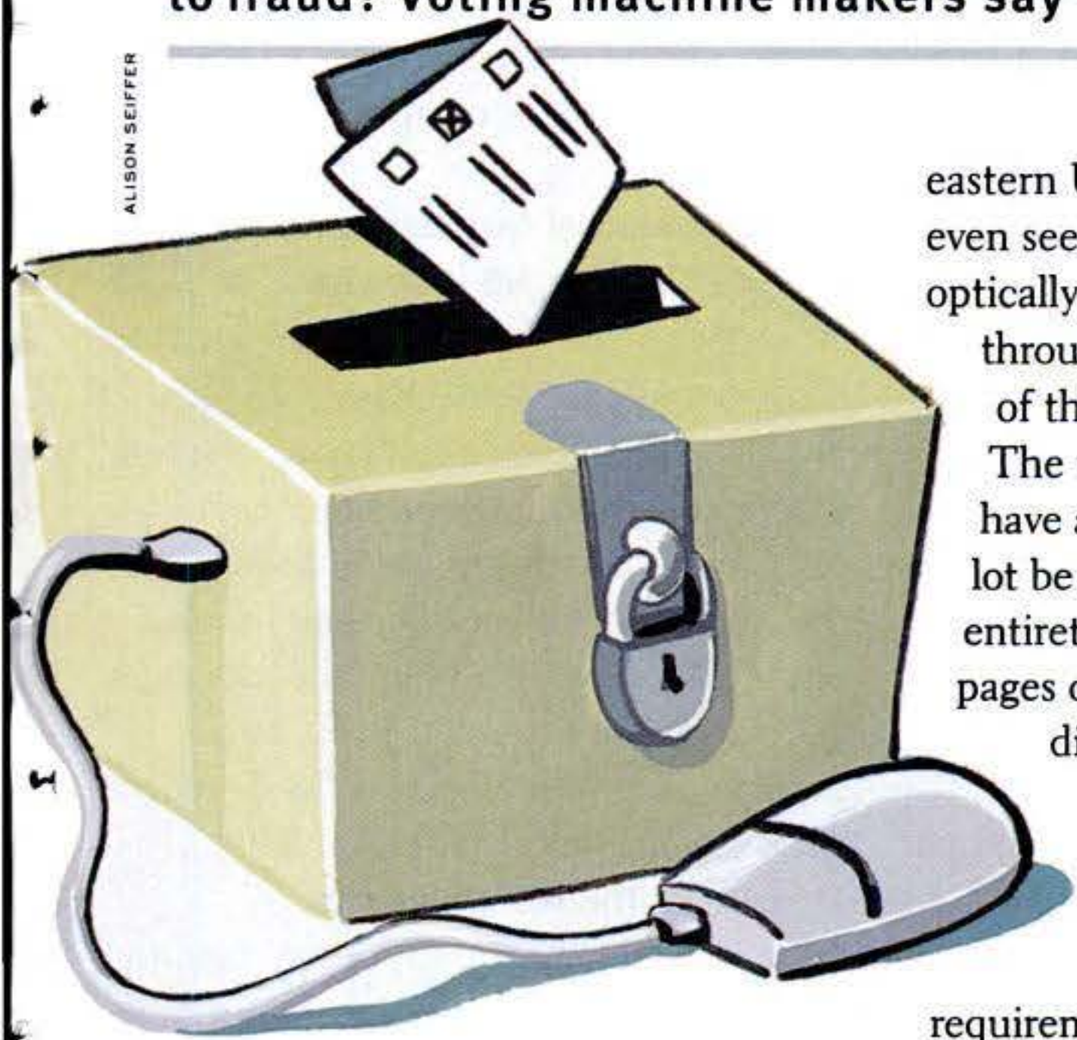
ESSENTIAL TECHNOLOGY GUIDE

ELECTIONS

New paths—the Internet, in particular—to electronic information about the candidates and the issues mean you'll cast a well-informed vote in 1996. You may even do it electronically. But will electronic voting lead to fraud? Voting machine makers say no, but others are not so sure. BY ROBIN NELSON

ALISON SEIFFER



How America Votes

TECHNOLOGY walks a fine line when it comes to polling systems. A morass of individual state constitutional provisions covers the process like a patchwork quilt. For instance, most regular voters in the Northeastern United States have never even seen the type of punch card or optically scanned paper ballots used throughout most of the remainder of the country [see chart below]. The reason: These oldest states have always required that the ballot be presented to the voter in its entirety—it can't have separate pages or even a reverse side. Newer direct-recording electronic (DRE) systems like those made by Sequoia Pacific Voting Machine Co. can comply with presentation requirements, but election officials get nervous about the entry of ballot data strictly on digital media—with no paper record available.

"The possibility of fraud in computerized election systems is a much-overstated threat," says Tom Eschberger, vice president of sales for Business Records Corp., one of the largest and longest-standing suppliers of computer equipment to the election jurisdiction market. "In 25 years, I only know of two attempts, and they were both so amateurish the perpetrators were immediately caught."

Glitches do occasionally occur, however, and one state, Wisconsin, has put a two-year moratorium on purchases of computerized voting equipment. Still, about 60 percent of all U.S. votes are already counted electronically, often incorporating modem transmission of punch-card or scanned data to a central tallying point. The gradual attrition of replacement parts for the old lever-voting machines, most of them three decades or more in service, means that some large Northeastern cities, including New York, must decide soon on replacement systems that may incorporate digital automation.

While there are a number of current ad hoc movements to enable direct voting from personal computers over the Internet, market-savvy people believe it will be a long time coming. "The security issues alone will take years to resolve; and besides, the last thing most elected officials want to change," notes Eschberger, "is anything that has to do with the way they were elected."

Electronic voting machines like this one from Sequoia Pacific are becoming more widespread.

ALEX REARDON

How America Casts Its Ballots

Type	Number of Counties	Number of Precincts	Eligible Voters	Registered Voters	% Registered
Punch-card	701	71,839	88,990,715	48,069,805	36.1
Lever	732	48,233	67,773,696	35,956,241	27.0
Optical Scan	766	35,329	51,426,309	28,623,413	21.5
DRE	14	5,827	10,670,323	5,778,768	4.3
Paper Ballot	628	9,923	6,718,816	3,686,049	2.8
Mixed Systems	161	13,366	22,582,253	11,079,620	8.3

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8 web sites To Find It All Out

Essential Facts to Know About Any Contest for a Major Office

A. Candidates' basic resume and affiliations. **B.** Incumbents' voting and attendance records **C.** Candidates' positions on key issues (speeches, bills introduced, etc.) **D.** Primary sources of campaign funding **E.** What are the odds?

Federal Election Commission
(http://www.fec.gov/). The FEC gathers official, required information on candidates for president, the House of Representatives, and the Senate. You can get an overall view of how the 1996 congressional campaigns are being financed, locate congressional candidates by state, and get financial summary information. Charts and graphs show the leading Political Action Committees (PACs) and how PACs have grown over the years. You can link PACs to candidates. Lots of downloadable data. [A, D]

Project Vote Smart
(http://www.vote-smart.org/campaign_96/). Virtually a one-stop political shopping center for facts and figures on congressional, gubernatorial and state legislative candidates. Coalesced around an independent organization whose stated aim is to "Turn the same slick, high technology used by candidates and elected officials around to the citizen's advantage." [A, C, D]

Almanac of American Politics
(http://www.politicsnow.com/resource/almanac/). Has extensive data on congressional voting patterns and campaign funding. Interactive voting option lets you compare your stand on major issues to that of your senator or congressperson. [A, B, C, D, E]

MSNBC's Decision '96 section
(http://www.msnbc.com/news/dec_front.asp) Give credit to the software giant/ TV net amalgam. Lots of interactive energy, with features like letting the browser try to pay for Bob Dole's tax cut by juggling real budget figures online. Special analysis of FEC figures linking candidates to PAC and big-industry interests. [A, C, D, E]

The National Budget Simulation
(http://garnet.berkeley.edu:3333/budget/budget.html) A site developed at the University of California that every Web surfer who intends to vote should be required to visit. It features the U.S. government's entire budget and invites one and all into the balancing act. [E]

Congressional Quarterly's American Voter '96 Web site
(http://www.voter96.cqalert.com/) Links to a fascinating interactive Rate Your Rep. module. Even if you don't know your senator or congressional representative's name, you can enter your zip code to play the game: Submit your position on a list of the most prominent national campaign issues, and the site will tell you, by percentage, how your elected official's recent votes match your ideology. [A, B, C]

The AllPolitics site
(http://allpolitics.com/) Sponsored jointly by CNN and *Time* Magazine, focuses on the presidential race rather than subordinate campaigns. [A, C, E]

The Gallup Organization's Election '96 site
(http://www.gallup.com/news/index.html) Spits out polls as fast as you can log in, and more of them than you ever imagined existed. Attitudes are sampled and results analyzed ad infinitum. [E]

Ballots No Secret in Arkansas

ARKANSAS REMAINS the last holdout administering a voting mechanism that generally dates to Reconstruction and was once common among Southern states: Each ballot and its tear-off stub bearing the identity of an individual voter are marked with matching numbers. The stated purpose is to ensure that voters can be identified and called into court to verify their votes in the event of a legal proceeding relevant to the election. However, this practice violates the principle upon which the U.S. electoral process is supposedly based: the secret ballot. Hypothetically, the matching-number system could be used to intimidate voters or classes of voters. The process has its local opponents, but to overturn it requires an amendment to the state constitution.

The provision is known as the "Black Patch" law, since an adhesive patch was placed over the ballot number to keep it from being read except via legal authorization—a rather ineffectual method of protection. As automation has progressed, the patch's thickness has sometimes caused malfunctions of scanning equipment. The solution has been to use an unreadable number printed in ultraviolet-reflective ink. Now anybody with a UV ("black light") bulb can read it.

Blue Smoke and Cybermirrors

FORMER HOUSE Speaker Tip O'Neill, a keen observer of the sleight-of-hand tricks politicians use, would have appreciated the new, Internet-based twist on electioneering. Although much of the content is predictable, the World Wide Web sites of the major national parties are well worth visiting. The Democrats are at *http://www.democrats.org/*; the Republicans, *http://www.rnc.org/*.

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How Those Pollsters Do Those Polls

ALISON SEIFFER

VOTERS can become weary of polls as a campaign winds down, and in public, candidates invariably profess to ignore them—at least, the candidates who are losing. But the fact is, pollsters are good and getting better.

Most election-eve polls in 1992 predicted the voting percentages eventually won by Clinton, Bush, and Perot well within the sampling margin of error; of some 300 such polls, none projected Bush or Perot as the winner.

Typically, these polls are generated by telephone interviews with 600 to 1,000 "likely voters" (18 or older) as determined by answers to initial questions. The phone numbers are selected as random digits by a phone-dialing computer.

Hypothetically, almost every person in America has an equal chance of being called (since most households have phones) . The samples may seem small, but the projection techniques, which are based on simple math, are proven enough to be regularly accepted as evidence by the courts when election results are legally challenged. No sample is as accurate as interviewing 100 percent of a constituency, of course. The "sampling error" or "margin of error" that accompanies every significant result is a mathematical statement of the largest possible difference that could exist between a random national sample and a poll that asked 200 million Americans the same questions. A 3 percent sampling error, for example, means that a poll giving a candidate a nominal 45 percent of the vote has a expressible range of diminishing probabilities extending both toward minus and plus 3 points (42 to 48 percent).

Often, after a random sample is collected, it's compared with U.S. Census statistics to determine the degree of compliance before the poll is finalized. Applying the mathematical tweaks that can correct for anomalies is one way polling pros get clients that pay them the big bucks.

The "exit polls" that play a key part in election night drama in American homes are even more accurate than other forecasts because the specially trained interviewers are using respondents who are known voters.

ALEX REARDON

Men Vote for the Good-Looking Candidate, Too

U.S. Census Projections* of the Population of Voting Age by Gender, November 1994

Male		Female
92,913	18 years and over	100,737
13,040	18 – 24 years	12,578
41,677	25 – 44 years	42,004
24,599	45 – 64 years	26,306
13,597	65 years and over	19,849

* in millions

How to Count Political Ads

APPROXIMATELY four-fifths of the hundreds of millions of dollars to be spent on political campaigns this year will go into television advertising. Politicians put so much stock in the tube's opinion-molding capability that they constantly monitor and analyze their rivals' efforts. To find out immediately what concepts their distinguished opponents may be testing in the hinterlands, candidates employ strategic intelligence systems like MediaWatch from Competitive Media Reporting (CMR), a well-known provider of advertising data and monitoring services.

This system is fed by custom-built computer sites in 75 U.S. metropolitan areas representing about 80 percent of the population. Broadcasts are monitored all day, every day on network TV and on 25 major cable TV networks.

It tracks about 93 million commercials a year. Whenever the system's computers sense a commercial is being broadcast, they record and digitize it to produce an audiovisual content "fingerprint" that is classified and compared with existing digital patterns—entirely by computer.

If no match exists, it's a brand new spot and will be transmitted to a sorting center for visual confirmation. If it's a political ad from a major candidate, chances are the opposition will be analyzing and preparing to respond to it within a day or two.

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Paranoia Strikes Deep, Into the Web It Will Creep

AT LEAST SOME form of computerization is used in tallying two-thirds of the aggregate U.S. vote [see chart p. 71], which makes a lot of people unhappy. They range from concerned officials, journalists, and computer experts to those who cite electronic vote counting as one more confirmation of a "conspiracy of the New World Order." You'll find them all on the World Wide Web.

A good place to start is the index from the 1993 Conference on Computers, Freedom, and Privacy *(http://www.cpsr.org/dox/conferences/cfp93/home.html)*, cosponsored by Computer Professionals for Social Responsibility and the Association for Computer Machinery. A series of divergent but excellent conference papers on the potential for computer election tampering (for instance, Waskell, Shamos) is linked.

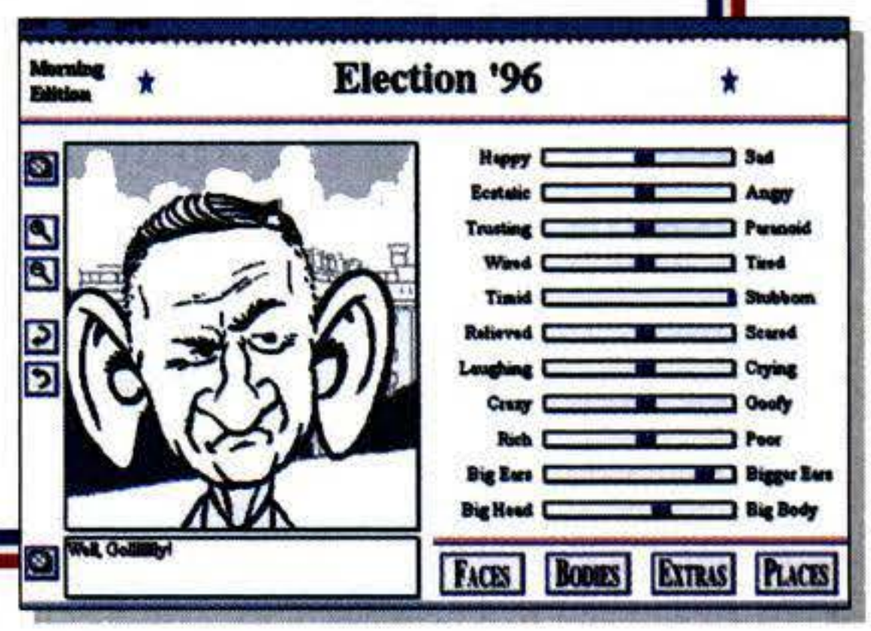
A somewhat less technical discussion of the risks in computer-based voting has been compiled by a Stanford University study group *(http://www.cse.stanford.edu/classes/cs201/current/Projects/electronic-vote-counting/index.html)*. Basic explanations of how programmers might employ undocumented or self-generating code, or plant "time-bomb" and "Trojan horse" viruses to affect an election's outcome are included.

And for a perspective you may find alarming—depending on your political orientation—get the ultraright NetworkUSA's report *(http://www.networkusa.org/index.shtml)* on how computers do the devil's work in election precincts. Links include a fascinating argument that Pat Buchanan beat Bob Dole in the Republican primaries only when paper ballots were manually counted. You decide.

Most credentialed experts agree there is always potential for computer-aided election fraud. They also acknowledge that, as difficult as it now is to design a system that can reliably process the virtually millions of permutations possible in the ballots of some 100,000 U.S. precincts, programming a system in advance that alters a significant number of votes without leaving a trace would be even harder. Any result in a major race that varied in the extreme from all the independent pre-election polls, for example, would be immediately suspect [see "How Those Pollsters Do Those Polls"].

Cartoon Satirist

Engage in the time-honored tradition of poking fun at the candidates by investing $15 in nFX's (1-800-845-9522) computer software Cartoon-O-Matic program. Here's one point of view.



Voter Registration Has Never Been Easier

A NEW FEDERAL statute known as the Motor Voter Law instructs states to permit voter registration by mail and at a variety of government offices, include welfare and motor vehicle bureaus. Since the law became effective in January, it has been possible to register to vote at the same time you are applying for a driver's license or registering a vehicle. Mail-in forms are available from the same locations or, even easier, downloaded from various state and local sites on the World Wide Web. Some 22 states will immediately accept a national voter registration form that can be downloaded from the Federal Election Commission Web site *(http://www.fec.gov/)*. Most others accept it as an application for an individual state form.

Since January, more than an estimated 5 million new voters have registered; a *New York Times*/CBS News Poll indicates about 40 percent are in the 18-to-29 age group. Since Presidential election years bring out the highest voter turnouts—averaging about 75 percent of the eligible electorate—1996 is expected to produce a record.

Polling: It's All in How You Ask The Question

ALMOST ALL of the persuasive power generated by presidential campaigns is directed at the 20 to 30 percent, on average, of eligible voters who are considered undecided. Polls accurately reflecting the opinions of this group are thus crucial to campaign strategy.

Because these voters are so valuable, questions used to identify them must be carefully phrased. For example, the following questions would produce widely divergent results, even though they are basically addressing the same issue, says F. Christopher Arterton, dean of the Graduate School of Political Management at George Washington University.

1. Do you support sending U.S. troops to Bosnia to enforce the recent peace accord?

2. Do you support President Clinton's plan to send U.S. troops to Bosnia to enforce the recent peace accord?

"Some opinions will be altered either in favor or against the proposal simply by the association with the president," Arterton says. ◆

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Reinventing the Home Computer

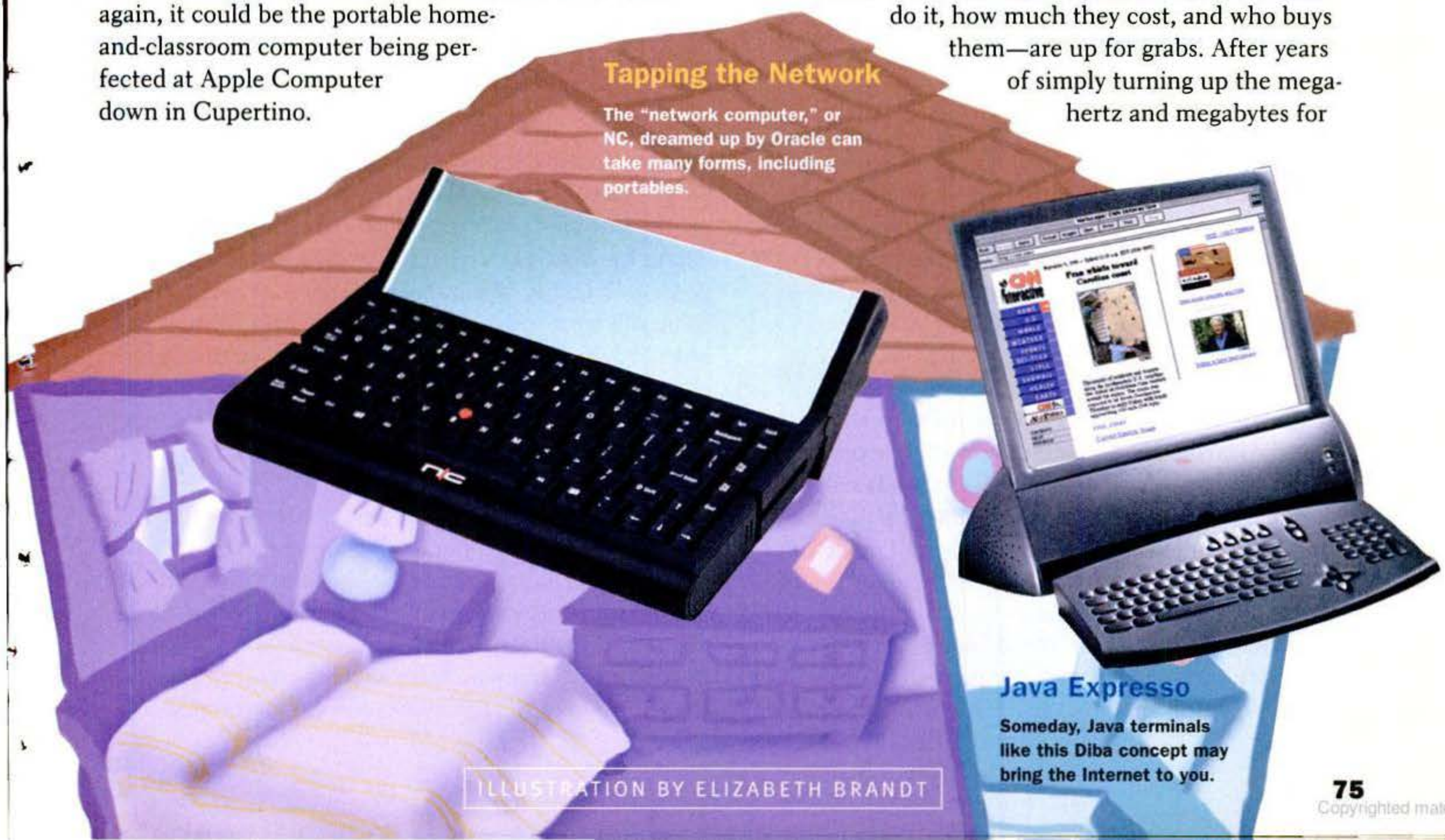
The PC is getting a makeover. But it may turn out to be a do-over.

By Chris O'Malley

WANDER THROUGH Silicon Valley, the cradle of computing that stretches from San Jose to San Francisco, and it's not hard to see the Next Big Thing in home PCs. It's something called the Network Computer, and it's inside the gleaming glass towers of Oracle Corp. in tidy Redwood Shores. Or, wait, perhaps it's one of the many "information appliances" being developed at startup Diba Inc. inside a renovated warehouse in a gritty industrial section of Menlo Park. Or maybe it's the slick Internet television system of WebTV Networks in brainy Palo Alto. Then again, it could be the portable home-and-classroom computer being perfected at Apple Computer down in Cupertino.

Even within this narrow band of occasionally shaky ground bordered by Routes 280 and 101, that's merely an abbreviated tour of the new thinking about home computers these days. There's much more: In San Jose, engineers at Sony Electronics are weaving the company's audio and video wizardry into home PCs, while designers at Acer America experiment with new shapes and colors. Meanwhile, in Santa Clara, mighty Intel is casting the home PC as a communications hub, even as nearby Hewlett-Packard bills it as an imaging center.

What's going on here? The same thing that's happening in the labs at Compaq, Gateway, IBM, Microsoft, Philips, Thomson, and countless smaller companies, here and abroad. They are reinventing the home computer, and our most basic notions about PCs—what they look like, what they do, how they do it, where they do it, how much they cost, and who buys them—are up for grabs. After years of simply turning up the megahertz and megabytes for



Tapping the Network

The "network computer," or NC, dreamed up by Oracle can take many forms, including portables.

Java Expresso

Someday, Java terminals like this Diba concept may bring the Internet to you.

ILLUSTRATION BY ELIZABETH BRANDT

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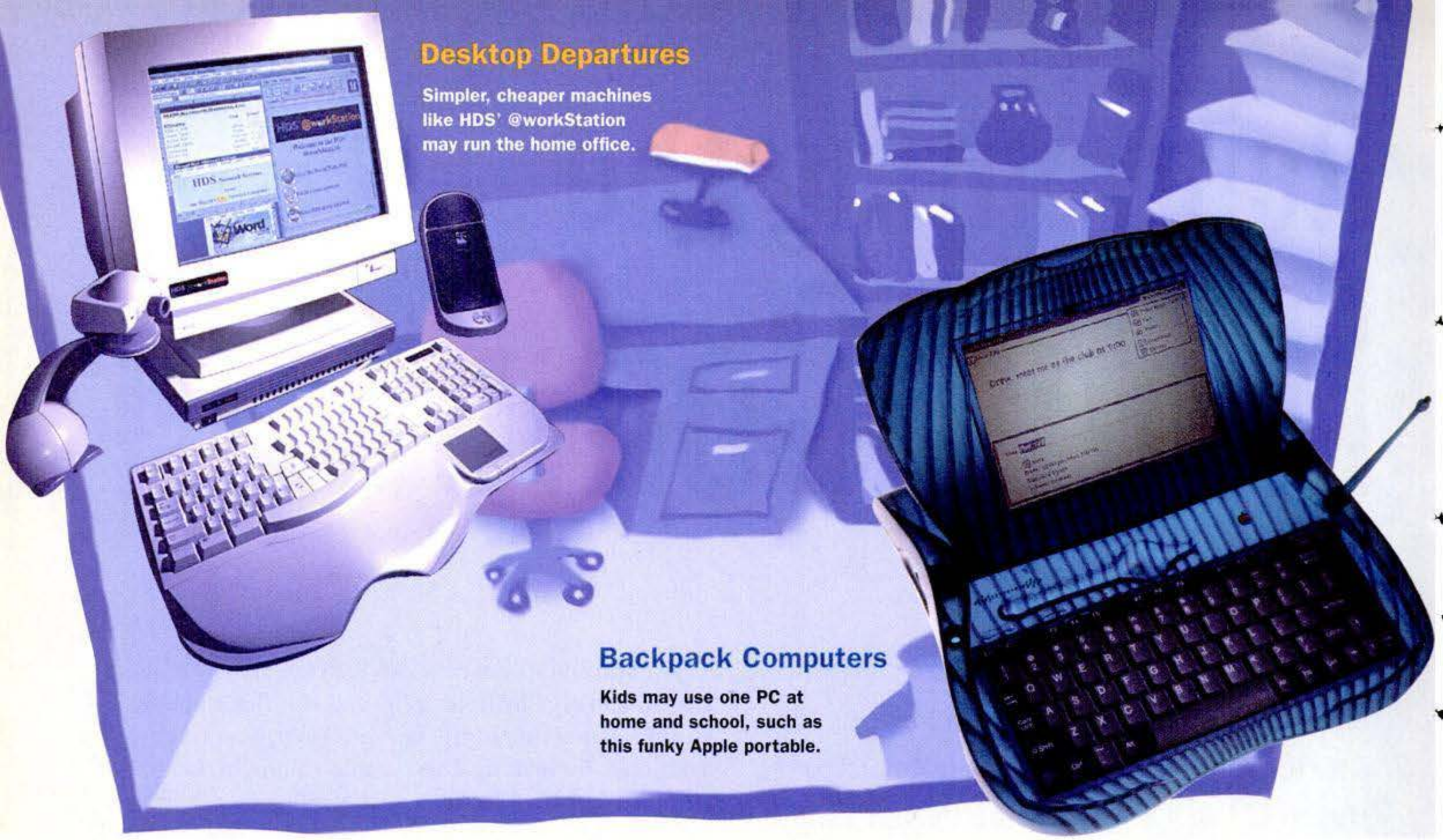

Desktop Departures

Simpler, cheaper machines like HDS' @workStation may run the home office.

Backpack Computers

Kids may use one PC at home and school, such as this funky Apple portable.

business customers and then passing the same boxes onto consumers, the computer and electronics companies of the world are endeavoring to build a home PC that can rival the telephone and television for usefulness and ubiquity.

Take your mark and get ready—the Race to Build the Great Home Computer is on. But this race has few rules and no clearly marked finish line. "The whole notion of a home computer is changing dramatically," says Andy Hertzfeld, the software wizard who helped create the original Macintosh—once touted as "the computer for the rest of us"—and who now toils at General Magic in Sunnyvale, California. "Computers in the home are going to be so diverse, and so pervasive, it'll almost be too broad a category to call them home computers."

On the surface, today's multimedia home computer might seem an odd choice for an overhaul—or an outright replacement. Computers get more versatile every year and, in time-adjusted dollars if not actual price, they are less expensive than ever. Home PCs have proven tempting enough that roughly a third of U.S. households have invested in one, and overall PC sales are still rising.

Yet, many both inside and outside the computer industry see the glass as two-thirds empty, with little prospect of filling. The "early adopters" and well-to-do families may have home PCs, they argue, but computers as we know them are still far too complex and costly for the less tolerant, less affluent masses. More intractably, many Americans still don't see the need for a PC in their homes. And many of the families who've already bought in aren't thrilled with their cranky, quickly outdated machines.

"The home PC has basically been a failure," asserts Paul Saffo, a director at the Institute for the Future, a digital think tank in Menlo Park. "It's been a sometimes useful failure, but nonetheless an artifact of office processing machines that do not present a very compelling experience for consumers." And that, he notes, is the lesson in all this for anyone who wants to bring computing home: "It's the experience, stupid."

How do you make a simpler, cheaper, stabler machine that delivers a more inviting experience? There is little consensus, but many of the disparate visions can be broadly categorized into five types of future PCs:

NETWORK COMPUTERS

Why buy a costly, complicated PC of your own when there are powerful computers outside your home that can supply the software, processing power, and storage space? That's the basic premise of the so-called Network Computer, or NC. Essentially, NCs are compact computers—some will be as small as TV set-top boxes—that rely on a link to a remote "server" computer to run everyday programs such as word processors and games, store data files, and surf the Internet. Many NCs will use the TV as the display, but they could also be coupled with a built-in screen or computer monitor.

There are several potential advantages to owning an NC rather than a PC. The most alluring may be its low cost. The NC has a central processor and some of the input-output functions of a PC, but not its large amount of memory, disk drives, or audio and video processing gear. In fact, several companies are working on putting nearly the entire set of NC functions onto a single chip. Conse-

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quently, homebound NCs are expected to cost between $300 and $700. Other pluses: There's no internal hardware to install or configure, software could be automatically updated for you, and because all files are stored on the network, you might never lose data again. Moreover, freed from Windows and Mac conventions, NC service providers and software programmers have another shot at making computers easy to use. "We know that computers are still way too complicated for many consumers," says Dan Stack, a manager in Oracle's NC division. "If PCs cost $1.50, my parents still probably wouldn't buy one."

But significant drawbacks will arise, too. Chief among them is the fact that the data pipeline into most homes—the telephone line—is a narrow one, which may result in more waiting than PC owners are accustomed to. And though cable and satellite alternatives are on the horizon, that pipeline may not change for years. There would also be as-yet-unspecified monthly service bills to pay (for server access and storage). For a while, at least, your software choices will likely be quite limited, too.

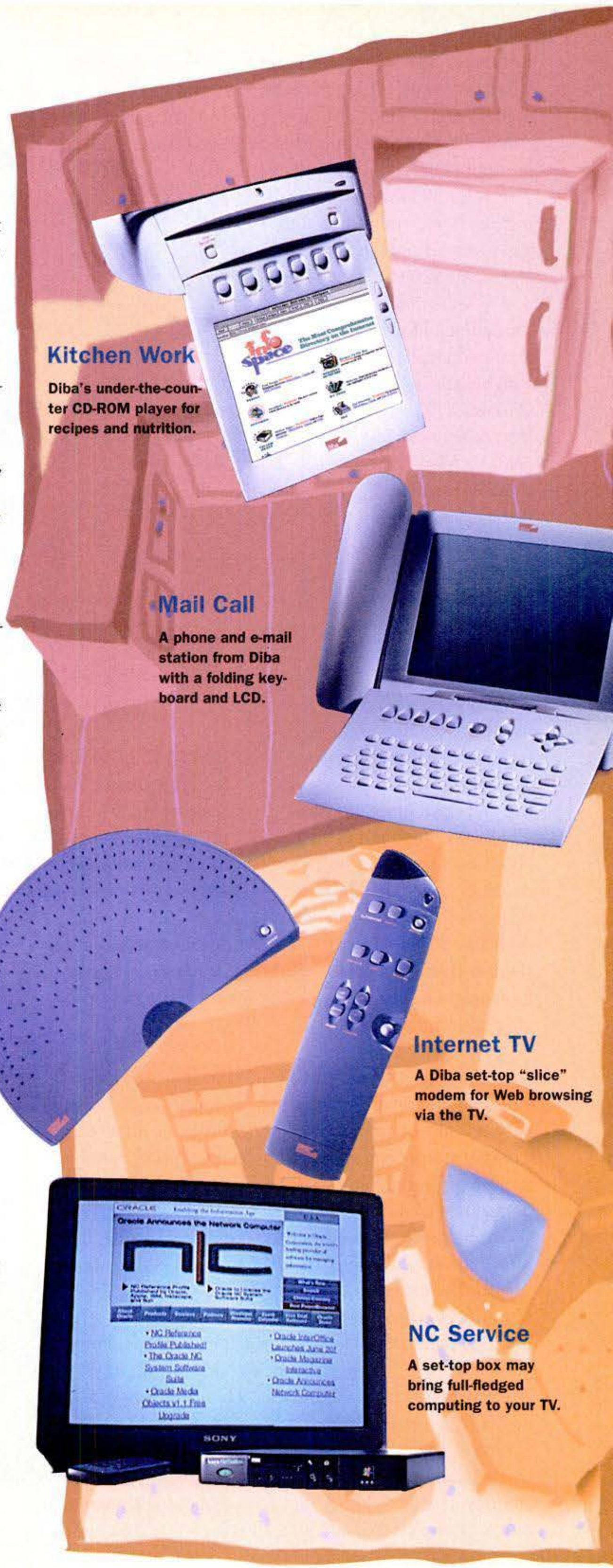
The NC concept was pioneered by Oracle, and the NC "reference profile" being used to build these systems was influenced and endorsed by Apple, IBM, Netscape, and Sun Microsystems. Several other notables, including Digital Equipment and NEC, are backing the effort as well. Oracle claims more than 60 companies are working on NC devices or services overall. The first wave of these NC-logo devices is expected to show up later this year or early in 1997.

TV COMPUTERS

Though they bear some similarity to NCs, computer-and-TV marriages—which have only recently begun tying the knot—generally do not attempt to redefine the PC or how we run software such as word processors. Rather, they fall into three subcategories that each seek to leverage the strengths of computers and TVs: Internet access devices, online game players, and full-blown PC-TV combinations.

Internet access devices, such as the set-top box from WebTV Networks that Sony and Philips (with its Magnavox brand) are selling under their own names, have a fairly narrow focus: They enable you to log onto the World Wide Web and send or receive e-mail via your TV and a phone line. [See "Web TV," October.] Most of the early devices will be in the form of set-top boxes, though Zenith Electronics and eventually others will put the circuitry inside TV sets, requiring only a phone line hookup. Though obviously limited in function, these Web browsing additions cost only $200 to $500—far less than even a basic PC with a modem.

Online game players attempt to mix the features of video games and CD-ROM discs with the appeal of the Web, again via your TV. Some in this new breed are, in fact, video game players. Sega's Saturn machine has a NetLink option for Web access, for example, and both Sony and Nintendo plan similar options for their systems.



Kitchen Work
Diba's under-the-counter CD-ROM player for recipes and nutrition.

Mail Call
A phone and e-mail station from Diba with a folding keyboard and LCD.

Internet TV
A Diba set-top "slice" modem for Web browsing via the TV.

NC Service
A set-top box may bring full-fledged computing to your TV.

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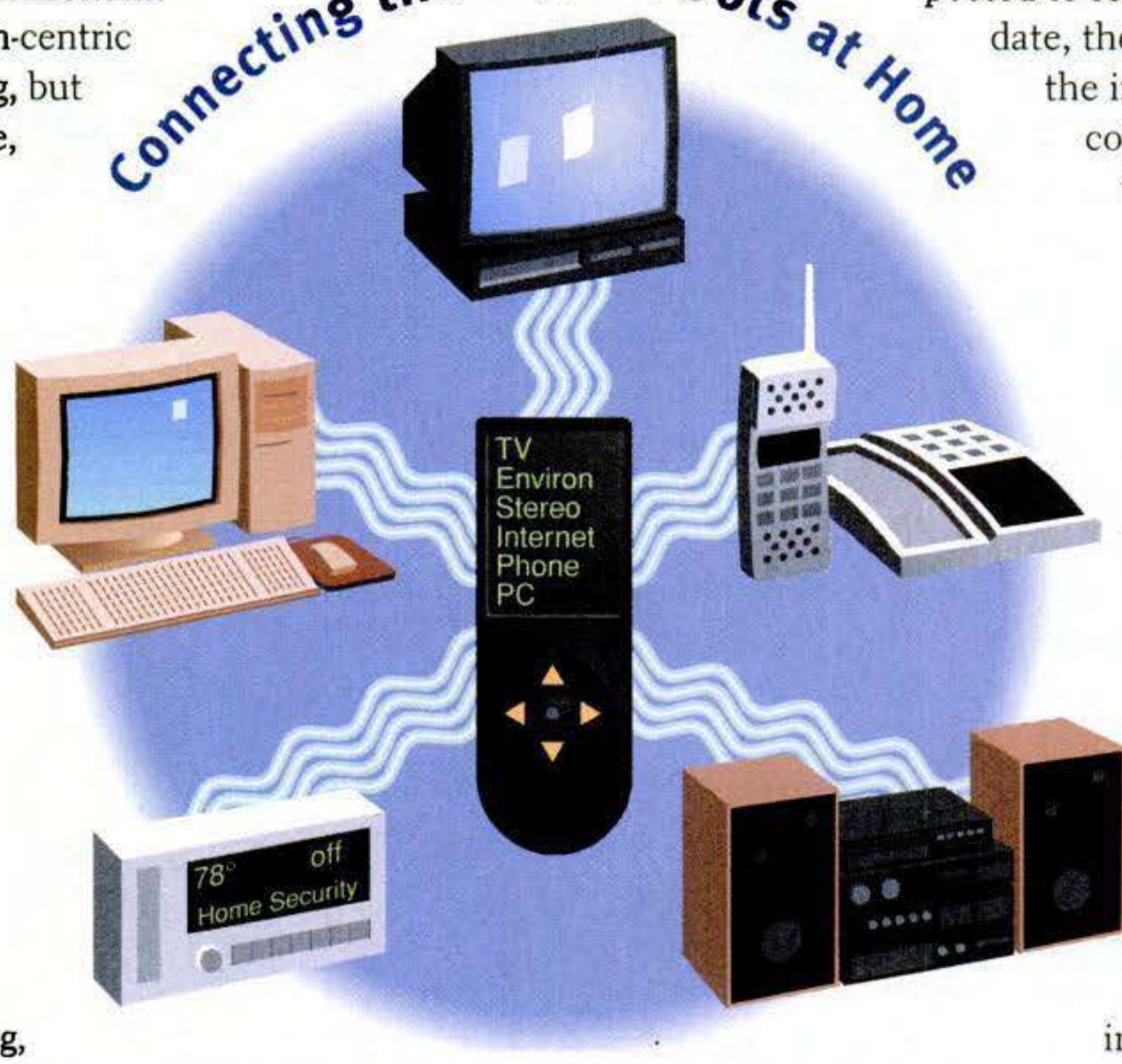
But newer devices such as Bandai's @World, which is based on Apple's "Pippin" technology and has both a modem and a CD-ROM drive, may lead the way to a more tightly knit relationship between off-line games and online connections. This is a very limited, fun-centric form of home computing, but also a very affordable one, at roughly $200 to $600.

PC-TVs are just that: the pairing of full-function, multimedia PCs with big-screen TVs. Gateway 2000's Destination and NetTV's WorldVision 2900 are the first two such products (both are Windows systems with high-speed Pentium processors), and others are in the works. Compaq and Thomson's RCA division are hatching a similar coupling, for example. The advantages? You get a system that can surf the Web, play standard-issue CD-ROM titles, and do just about anything a PC or TV could do separately. The downsides are that it costs plenty ($3,000 to $4,000 so far), the TV picture may not be quite as sharp as that of a regular TV, and the couch in the family room might not be the best environment for homework or after-hours office work.



HOW DO YOU LINK electronic devices at home? BeComm Inc., of Redmond, Wash., has a wireless solution slated to debut in 1997. Under its plan, a "consumer network tap" will feed information to various devices, which talk to each other via infrared or RF relays. A "super remote" lets you control and direct information between devices.

INFORMATION APPLIANCES

This could easily be construed as the miscellaneous category, and it's certainly part that. But mostly, the emerging world of sundry information appliances is tied together by a simple design philosophy: Single-function devices work better than multifunction ones.

In the performance-oriented computer business, these information appliances are often dubbed "application-specific computers," but in reality they're being defined as much by *where* and *how* they'll be used within a household. "A lot of these appliances will be location-convenience devices," says Laurie Frick, vice president of emerging markets for Compaq. "There can't be a multimedia PC in every room."

Small, inexpensive info appliances may fill the voids. Some examples: a kitchen e-mail phone, a living room electronic yellow pages book, a bedside health-care communication system, and a family room Internet radio (for receiving words with the music). Several of these devices and services are already under development at companies including AT&T, GoldStar, NEC, Panasonic, Samsung, Sharp, and Zenith. Most are expected to sell for less than $300. To date, the biggest proponent of the information appliance concept is Diba, whose software many of these companies are using. But the idea is catching on. Apple recently created an information appliance division, for example, and Compaq says it is experimenting with single-function devices. "We've got to take the computer out of computing to bring in new people," says Mark Orr, a business development manager in Apple's information appliance division.

DISTRIBUTED COMPUTERS

Take the network computer and information appliance concepts, mix well, and pour into your walls. That's the recipe for another home computing vision called, rather vaguely, the distributed computer. The idea is to have powerful PCs serve as control centers, tying together and feeding information and instructions to many other devices throughout the house. "The end-all solution is to make the PC disappear," says Frank Casanova, director of Apple's Exploratory Products Laboratory. "A home computer should be a device in which you live, not a device you sit in front of."

The computer itself may not disappear for a while, but it may get tucked away in a closet. Essentially, this is the home version of the game plan already being played out in offices across America, in which a central server connects many desktop computers. In the home, that server—which has also been dubbed an information "furnace" or "fuse box"—could control everything from home security to how much time the 10-year-old is allowed to spend surfing the Web on his bedroom TV.

Though its sounds exotic, much of the technology for making such things happen is already available. In fact, many computer-controlled home automation systems are being sold today, based on one of several competing standards, including X-10, Consumer Electronics Bus (CEBus), and Echelon Corp's LonWorks. There are also a number

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of independent efforts, such as BeComm Corp.'s Communicator system for linking all types of electronic devices [see diagram]. But you won't necessarily have to buy into a complete system. Two standards for simply connecting computers with other electronic devices are emerging: Universal Serial Bus (USB), and the higher-speed P1394 (also called Firewire) standard. One recent product that shows the potential of those connections is Sony's VisionTouch software, which lets you control a 100-disc CD jukebox with a PC. "Consumers aren't demanding this kind of thing," concedes Takashi Sugiyama, director of PC product marketing at Sony. "We've got to tap into a hidden desire... like we did with the Walkman."

The bad news here is that a distributed computing system in your home today usually means rewiring the house. But there's plenty of research into using existing phone or AC wires, or wireless RF connections, to do the job.

CONSUMER PCS

Amidst all of the new alternatives, will the all-purpose, multimedia home PC survive? Many technologists think it will survive—and even thrive—with some reinventing of its own. "PCs have only been consumer products for three or four years," says Avram Miller, vice president for business development at Intel. "The computer industry is just starting to pay attention to those things that make them better suited for the home."

Simplicity is perhaps chief among those things. Microsoft's Simply Interactive PC project—endorsed by Compaq, Hewlett-Packard, Intel, Toshiba, and others—is one of the most visible efforts to address some of the thorny problems that plague today's PCs. The SIPC is not a computer itself, but rather a collection of compatible hardware technologies designed to make Windows PCs more like stereos, VCRs, and other consumer electronics devices. Among the new wrinkles in the works are an instant-on button (no booting process), a standard way to connect PCs to other audio and video devices in the home, and a sealed-case design that can be easily expanded or upgraded with external additions. Most of these improvements will begin appearing in home computers in 1997.

The relatively high cost of PCs is being addressed on a number of fronts as well. Several companies are developing capable, but not cutting-edge, home computers that cost less than $1,000. Acer, for example, recently began selling in Asia a $500 Windows PC called AcerBasic that it plans to bring to the U.S. market next year. Apple is addressing the cost problem from another angle through its education division, with a new portable computer that kids can carry from school to home and back again. That as-yet-unnamed model is expected to sell for less than $1,000.

But many others think the real challenge is to make the home PC an irresistible purchase, whatever its costs or hiccups. And the two keys to creating such a machine, say many experts, are better multimedia and communication features. On the multimedia front, realistic 3-D graphics, TV-like video, and surround-sound effects on a PC are now all within a year's reach, as are the digital videodiscs (DVDs) needed to deliver the content. High-bandwidth communication pipelines into our homes, such as digital phone lines and cable TV data services, may still be two or three years away in most parts of the country. But when it happens, the Web could become a dramatically livelier place, and video phone calls and video mail via PCs could quickly become practical.

In any case, many see room for both the new devices and the perpetually evolving PC. "People often make the mistake of thinking that the interesting part of new things is how they replace the old things," notes Nathan Myhrvold, a vice president at Microsoft, and its leading technologist. "TV was not radio with pictures. It was a new medium, and radio survived. So will PCs."

"We've got to take the computer out of computing to bring in new people."

Information Furnace

A basement "server" could feed computers in every room.

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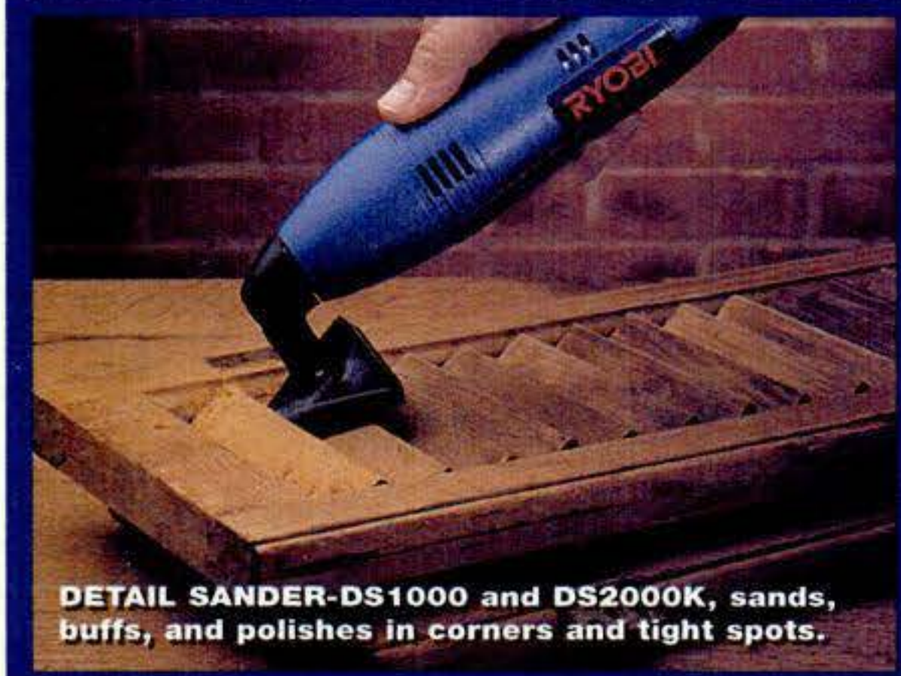

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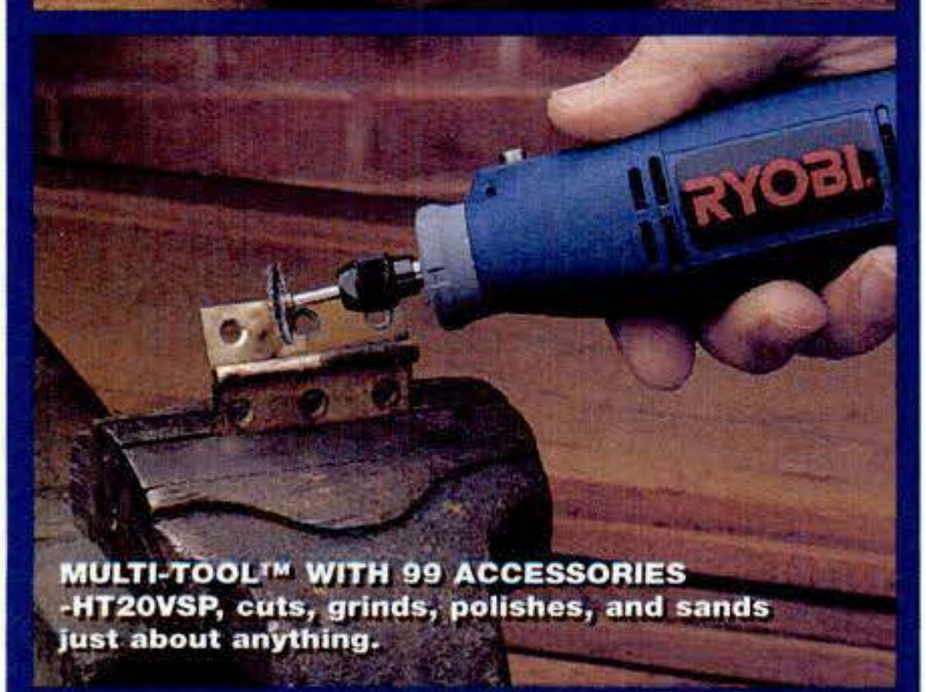

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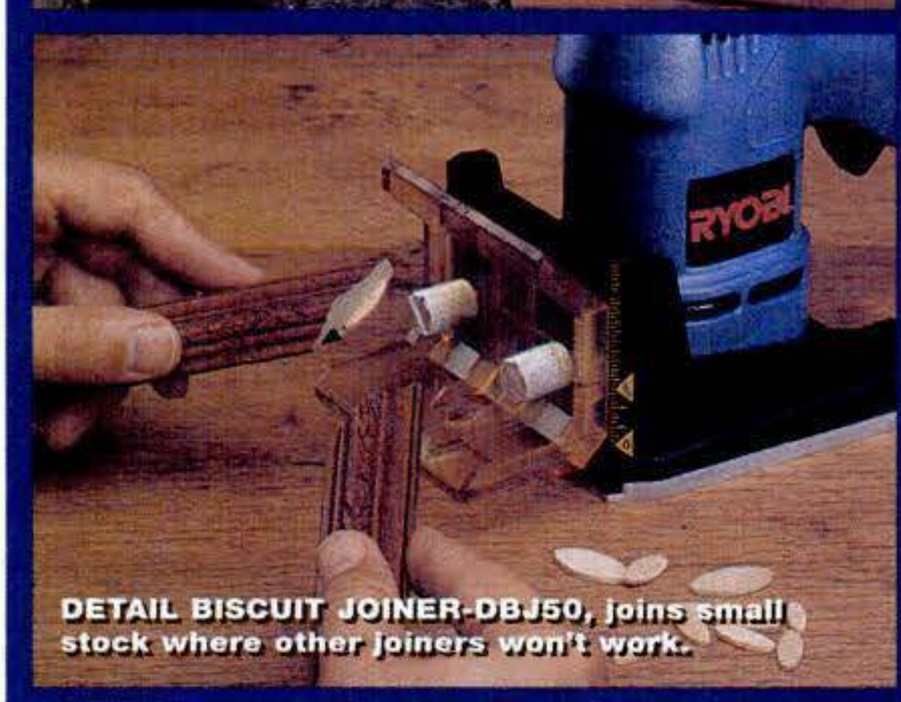

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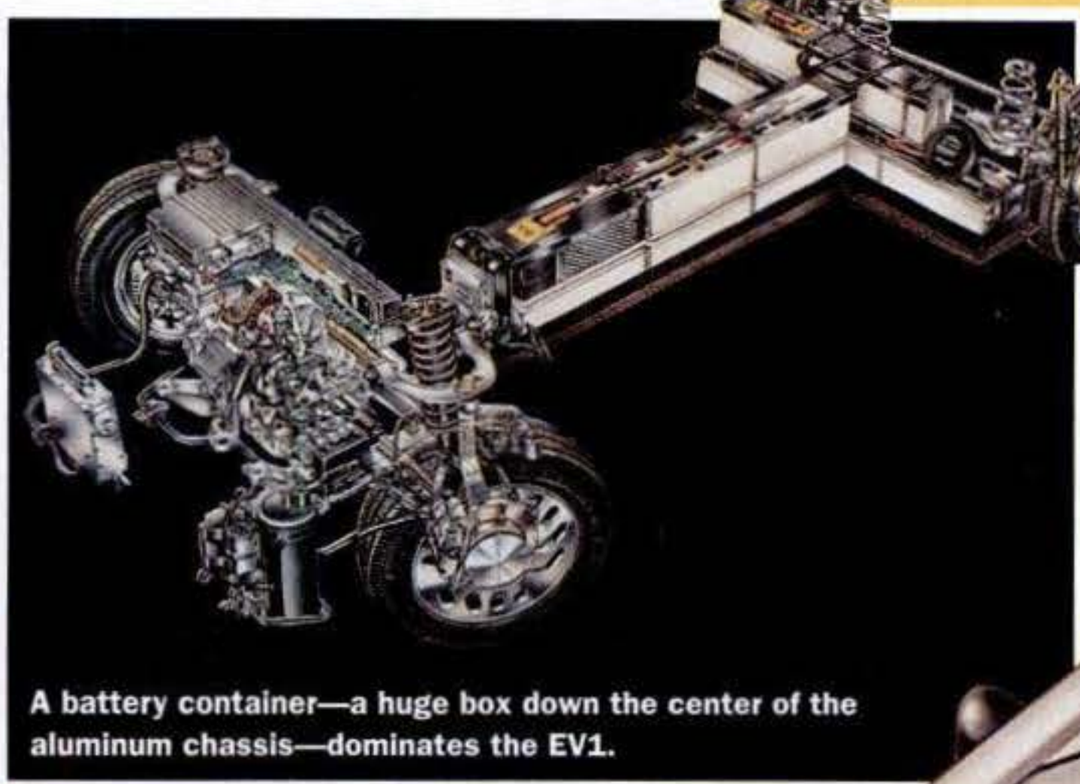
The Electric Experience

What, exactly, are you getting into if you decide an EV1 is for you?

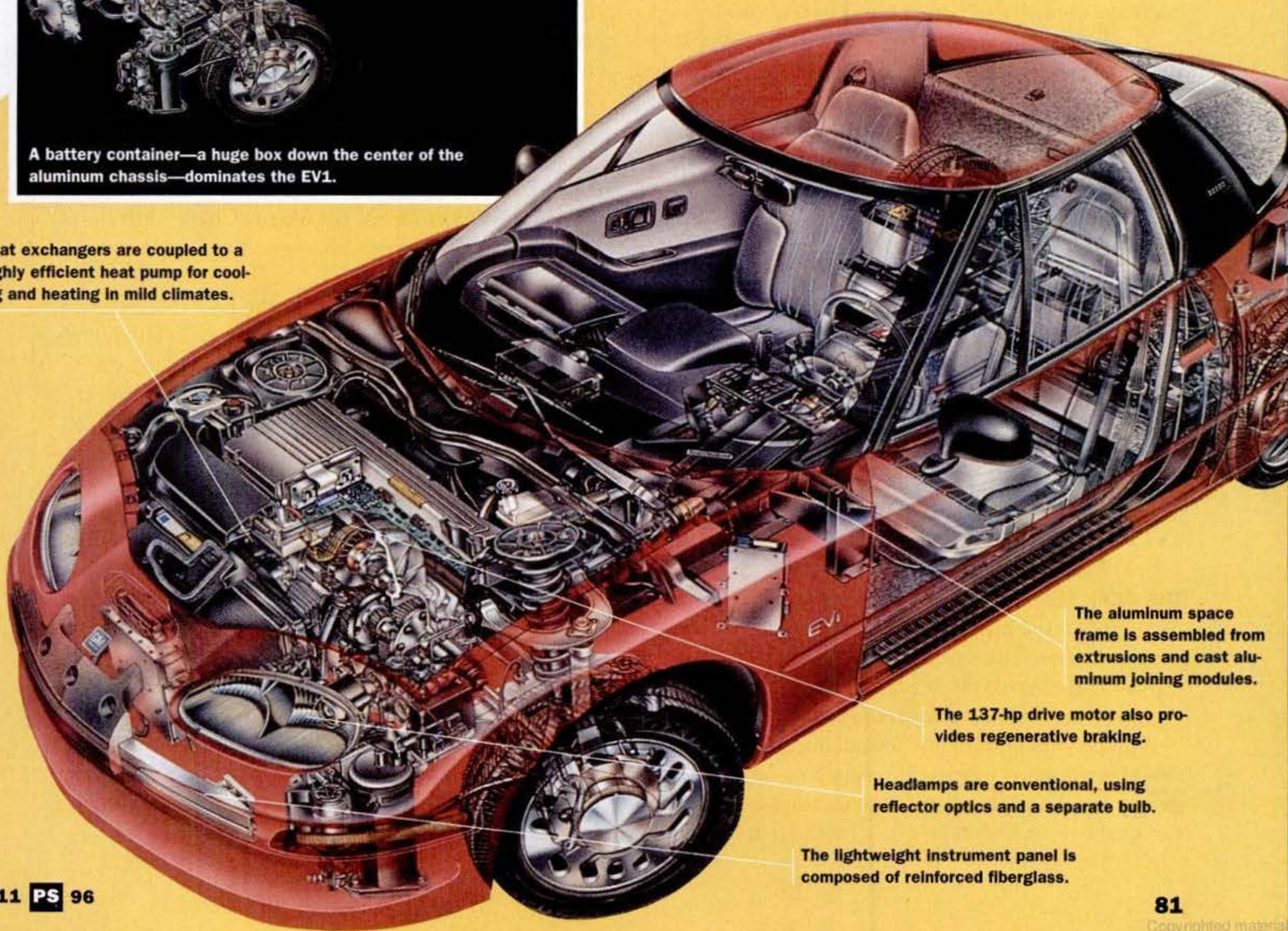
By Ron Cogan

THE FIRST KICK at the high-pressure sidewalls of the ultra-low-rolling-resistance tires of GM's EV1 underscores the fact that the first electric car being marketed to the general public in decades is, well, different.

The difference is more fundamental than the mere fact that the EV1 is powered by a 137-horsepower, three-phase, AC induction electric motor that taps the stored energy of



A battery container—a huge box down the center of the aluminum chassis—dominates the EV1.



Heat exchangers are coupled to a highly efficient heat pump for cooling and heating in mild climates.

The aluminum space frame is assembled from extrusions and cast aluminum joining modules.

The 137-hp drive motor also provides regenerative braking.

Headlamps are conventional, using reflector optics and a separate bulb.

The lightweight instrument panel is composed of reinforced fiberglass.

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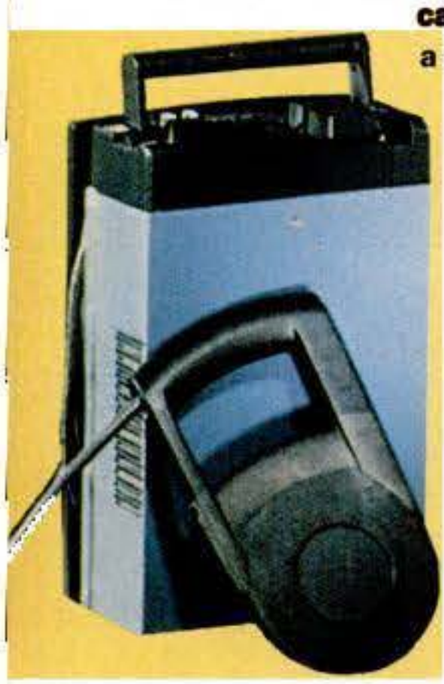

The induction-type charger is intended for wall-mounting in the garage. It conducts the current magnetically, and has no direct contacts—a feature designed to increase the safety of the installation.

its lead-acid battery pack. Until now, electric cars have been prototypes, experimental abstractions. But the EV1 sits ready at Saturn dealerships, gleaming like some fiberglass fish out of water, waiting to be driven home, if you want it.

The thought is tempting, despite the reservation caused by the short range between recharges—less than 80 miles when driven more or less normally. The EV1 is an eye-catcher guaranteed to put you at the epicenter of car talk for a couple of years. It could even save some money on gas. But what, exactly, are you getting into if you decide that an electric car is for you?

AT THE DEALERSHIP If you're eager for a test drive and happen to live within an area served by a California or Arizona Saturn franchise that carries the EV1, a word to the wise: Be prepared for an out-of-(car)body experience.

Mention that you're on the trail of an electric car and not a Saturn SL, and the semblance of a normal purchase transaction ends. Don't count on getting behind the wheel of an EV1 after five minutes with a salesperson. And even if you're eager to sign up, it isn't likely you'll be driving one home the same day, either...at least not your own.

The EV1 brings with it the demise of a process we've always taken for granted—test-driving cars at a dealership, negotiating terms and price, and driving home in a new vehicle, all within a span of hours. That's the last thing that GM wants with its premier electric vehicle. The company would rather get to know you.

GM aims not only to familiarize you with the uniqueness of EVs, but to carefully screen its customers to ensure an electric vehicle is right for them. Saturn sales consultants will answer your questions about the EV1 and then, if your interest level remains high, arrange an appointment with an electric-vehicle marketing specialist.

Even if you are sold on the EV1 at this point and want to drive one home, you may be asked politely to live with a demo model for a day or two to ensure it meshes well with your lifestyle. Then, a service provider will visit your home to determine if any obstacles stand in the way of installing the EV1's required 220-volt Magne-Charge unit in your garage.

THE DEAL This electric vehicle's price tag, still pegged ambiguously "in the mid-$30,000s" at press time, seems steep for a special-use, two-seat sporty car, especially considering the 70-to-90-mile driving range. Fortunately, financial incentives can help pare down the price.

A 10 percent bottom line federal tax credit for EV purchases is already in place. Currently, anyone living in the greater Los Angeles or San Diego metropolitan areas will also qualify for a $5,000 purchase incentive through South Coast Air Quality Management District and San Diego County Air Pollution Control District programs. EV purchase incentives are also offered in Sacramento, Santa Barbara, and Ventura counties in California, although the EV1 is not yet being marketed in these locations. Similar measures will be possible in other states when electric vehicle marketing begins in earnest. Other financial lures, such as Arizona's reduction of vehicle registration fees for EV buyers, are also likely in EV marketing areas.

Recognizing that a high price could hurt the EV1's rollout, GM has cleverly opted for a lease-only strategy.

The three-year lease will be a comprehensive owner-care package, says Saturn vice president Joe Kennedy. This means free maintenance, roadside assistance, and even a battery-replacement warranty during the lease period, important considerations to those who might feel some anxiety with new technology.

GETTING READY AT HOME The EV1 recharges with the Hughes-developed Magne-Charge inductive charger from Delco Propulsion Systems. The unit employs a weatherproof plastic paddle to transfer electrical energy from a 6.6-kilowatt residential or public charger to an EV's charge port via a magnetic field. Because there is no metal-to-metal contact, this system is touted as being completely safe to use, even in the rain.

The utility industry's description of an EV is a "house on wheels." That's because when using a 6.6kW Delco charger, an EV's energy consumption is on a par with a household's total average demand of 6- to 7kW.

If you have a detached garage and an older main panel filled with circuit breakers as a result of modifications in the home, costs could increase significantly if major electrical work has to be done, says Peter Michalski, director of operations at Edison EV, the Magne-Charge distributor in Southern California. (EV Power handles Arizona.)

KEEPING IT RUNNING Because the EV1 integrates an array of onboard high-voltage systems, you can't merely drop in casually at the service station or set the car up on jackstands on the driveway for a repair project. Owner maintenance is limited to washer fluid, brake fluid, and cooling system level; remote sensors at each tire automatically monitor air pressure.

The EV1 is a low-maintenance vehicle by design, with far fewer moving parts than a conventional automobile. Its electric propulsion unit is designed for 100,000 miles of use before routine maintenance, and its 26 Delco valve-regulated lead-acid batteries are maintenance-free. The extraordinarily smart car also has a high level of diagnostic capability; sensors even report if any portion of the battery module needs replacing.

EV1-specific diagnostic equipment, 220-volt charger hookups, and a battery lift to remove and reinstall the vehicle's 1,100-pound battery pack will be on hand for use in any of the dealers' repair bays as needed.

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In the event an EV1 does suffer a malfunction, the defective component will be removed and replaced by the dealer. The defective part is then sent back to GM for testing to determine why it failed—part of a continuous quality improvement effort. EV1 parts will be stocked at regional warehouses and delivered to the dealer either the same day, or the next. Battery packs will be provided via next-day delivery by Delco Propulsion Systems. Delco will also receive all end-of-use batteries from GM electric vehicles for recycling. (The batteries are 95 percent recyclable.)

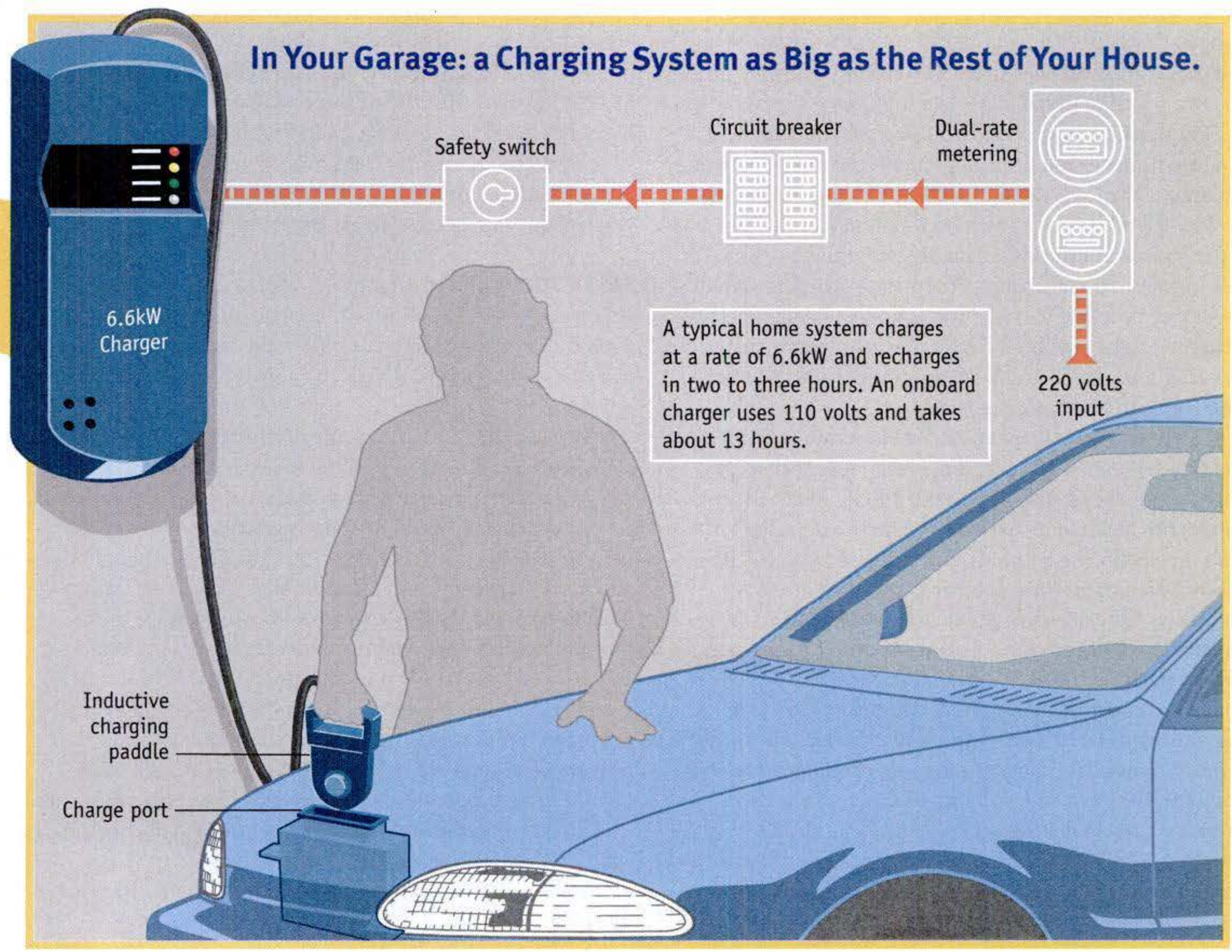
When an EV1 is damaged in an accident, repair work on the aluminum structure and fiberglass body panels will be handled by an authorized Saturn dealer.

EV1 customers are encouraged to not stray too far from the car's initial marketing areas, since authorized service will not be available. While roadside service is included as part of the three-year lease, it's likely that towing charges outside of these Saturn dealers' assigned territories will be borne by the customer.

ON THE ROAD Slide behind the wheel of the EV1 and it's impossible not to notice something's missing. For starters, there's no ignition key. In its place is an electronic keypad that activates onboard systems in response to a secret code. Also gone are a few things to which we've grown accustomed, like water temperature and oil pressure gauges, and shifter selections that go beyond park, reverse, neutral, and drive. (A single-speed drive unit obviates the need for low gear and overdrive.)

Plenty of familiar features remain, though, including a Delco AM/FM/CD/cassette stereo system and such everyday accoutrements as power windows, heating and air-conditioning controls, speedometer, trip odometer, and a variety of status indicators. But some new twists are also offered, such as displays for state of charge, time to full charge, vehicle range, and passenger-compartment environment preconditioning.

Preconditioning is one of those interesting byproducts of electric vehicles that, once tried, will forever be among an EV driver's favorite features. While the EV1 is connected to a charger, it can be programmed so its innovative heat pump automatically heats or cools the car's interior to a desired temperature at a specific time...say, about 10 minutes before you're ready to head for work. If you plug in again at the work site, this same feature can also condition the interior to a comfortable temperature for your drive home.



SLIM FILMS

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WHERE YOU CAN DRIVE California and Arizona offer the warm temperatures that least compromise battery performance—one reason why the EV1's dealerships are confined to these states. This limitation could be eased, however, once thermal controllers are integrated to keep batteries warm in cold environments.

The number of charging sites in existence today is uncertain. The Electric Vehicle Association of the Americas identifies 975 "non-residential" charging outlets in 188 locations across the country; 663 of these are in California. The majority of these, however, are for company fleets, and not for public use. When you compare the number of charging sites to the approximately 140,000 gasoline pumps found at more than 14,000 service stations in the state, the infrastructure challenge is brought into focus.

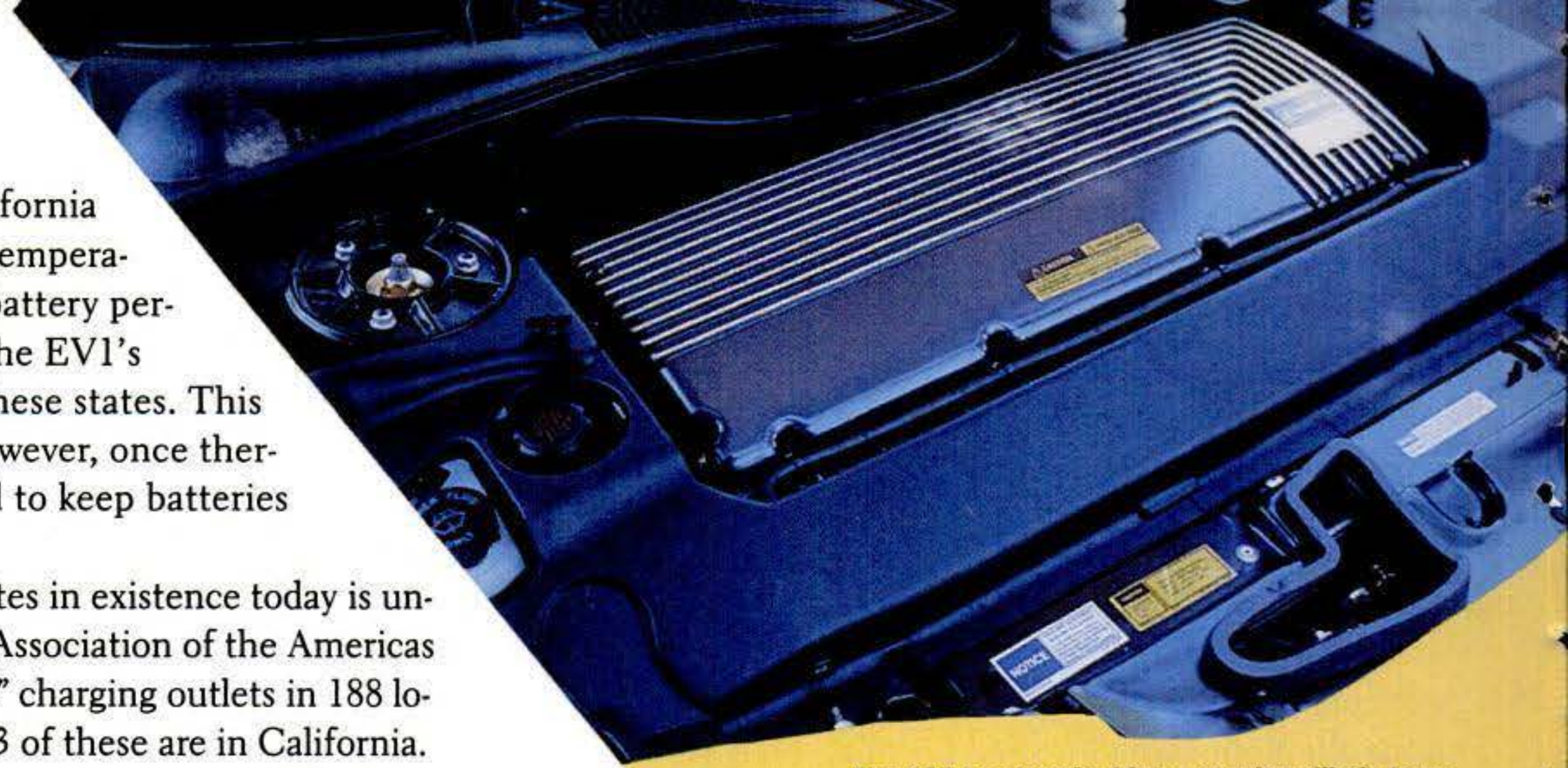
The most extensive public charging networks are in the Los Angeles and Sacramento areas, but even there, public chargers are likely to number far less than 100, and less than a third are of the inductive type compatible with the EV1. Because GM, Nissan, and Toyota are embracing the Hughes inductive protocol, and Chrysler, Ford, Honda, and others are adopting the more conventional conductive (metal-to-metal contact) plug format, a full-fledged standards war is underway. That's the last thing the emerging electric vehicle field needs as it gears up to become a real market.

"We think that one standard must prevail, and the reason [the balance] will tilt toward one is the public charging situation," says Michalski of Edison EV. The reasoning is simple. If both formats must be accommodated—and this is the approach utilities are taking, since the outcome of this format battle is unsure—then each charging station's net effectiveness is halved. "We can only install inductive [chargers] right now because there's not a conductive system that's UL listed and FTC approved," adds Michalski, "but that's just a matter of time."

The Los Angeles Department of Water and Power has installed more than 100 charging sites in recent years, but only 30 of these are available to the public, and most are conductive. Both inductive and conductive charging formats are now being emphasized, and "well over 100" public or work-site chargers are planned by the end of 1997.

Edison EV expects 28 public inductive chargers to be available in Southern California during the EV1 rollout, with as many as 200 additional inductive and conductive chargers in locations throughout the greater Los Angeles area during the next year. The company is already in the process of installing them at shopping centers, restaurants, hospitals, theaters, and various parking structures.

Just what will driving an EV1 cost, you wonder? Southern California Edison, the regional electric utility, projects a fuel cost of about $16 per month when charging at off-peak nighttime or early morning hours. This is based on a cost of 1.3 cents per mile, compared with 6 cents per mile for a typical gasoline-powered car achieving 25 mpg. A $2.40 monthly charge for a separate meter and a 75-cent per-month basic service charge are also incurred when signing up for the off-peak EV charging program. Charging during more expensive daytime hours could significantly skew these figures.



The 137-hp electric drive motor is unlikely to require major service. If there is a problem, components such as the motor system and electronic control module are designed to be removed and replaced, to be repaired at the factory.

The costs of residential charging, which involves the addition of the 220-volt circuit and installation of the Magne-Charge unit, must also be factored in. Both can either be purchased or leased. Edison EV expects most homeowners to pay for the circuit installation ($750 to $1,000) outright. But the charger, at about $2,000, will likely be leased for an estimated $45 per month. Edison EV projects that charger costs, which are high now because of limited production, will decrease to around $500 when they are marketed in greater numbers.

FAST FOOD With the limitations, rewiring, and all-around adventure of setting off down the road in a car that is stretching the limits of technology, the nagging question remains—why bother? The short answer is many won't, but some will.

"Because the EV1 is a two-seat vehicle and does not have long-distance range [to] 200 miles or 300 miles, EV1 will play a role in the owner's portfolio of vehicles," says Saturn's Kennedy. "In truth, today's gasoline-powered products are not all-capable vehicles, and they're not bought and used that way by most households."

The EV's function is analogous to a microwave oven, says Kennedy. "When you need to heat something up quickly, you use the microwave." He sees the EV1 not as a primary household vehicle that fulfills all driving needs, but rather the fun one "playing the subordinate role of the microwave in terms of shorter, quicker uses around town." Driven in that manner, the EV1 clearly can cook. ◆

EV1 brochures are available by calling (800) 25-ELECTRIC. Those who prefer their information via the Internet can look up http://www.gmev.com or http://www.saturncars.com.

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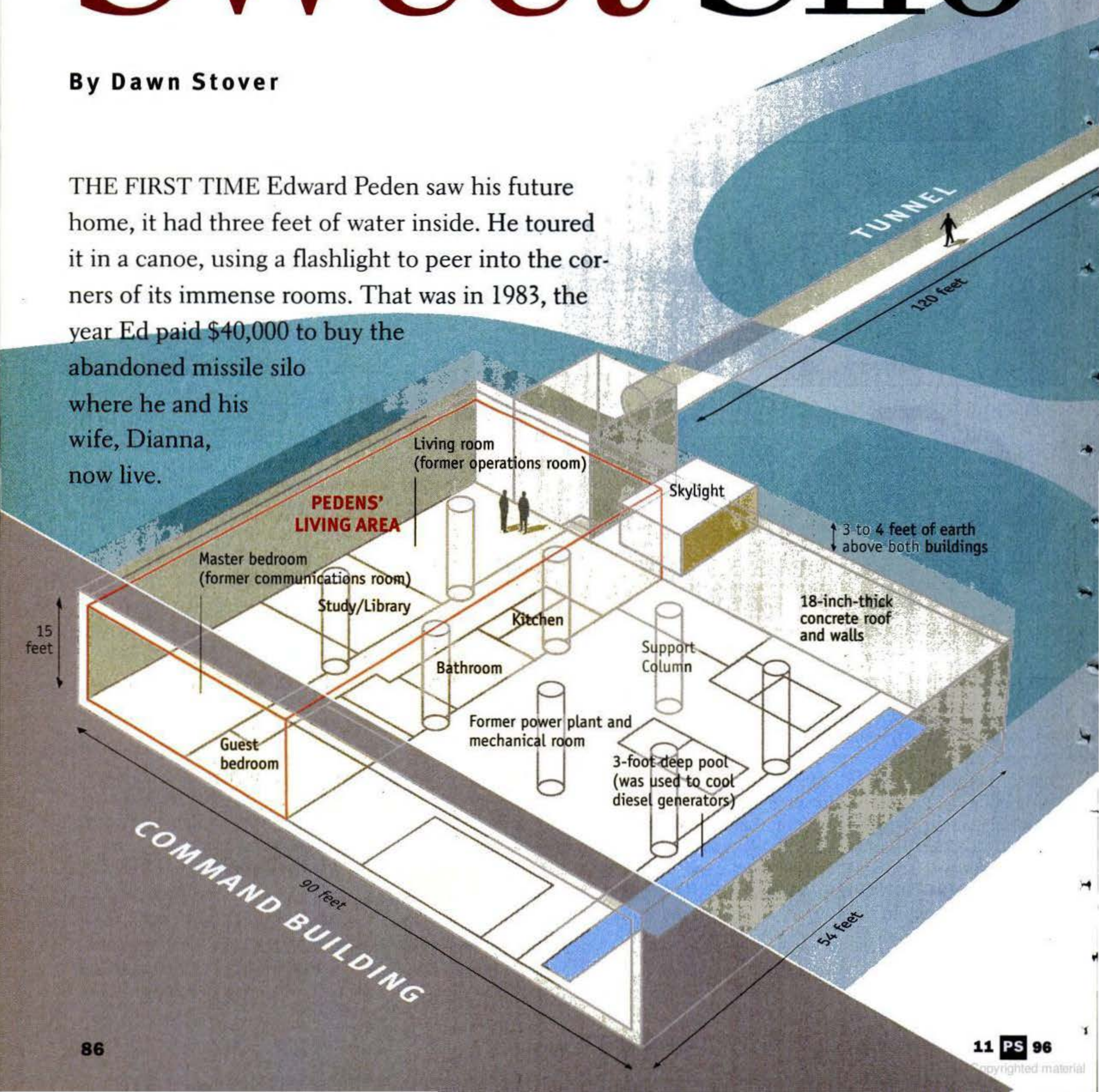
Home, Sweet Silo

What do you do with a decommissioned missile site? Live in it.

By Dawn Stover

THE FIRST TIME Edward Peden saw his future home, it had three feet of water inside. He toured it in a canoe, using a flashlight to peer into the corners of its immense rooms. That was in 1983, the year Ed paid $40,000 to buy the abandoned missile silo where he and his wife, Dianna, now live.



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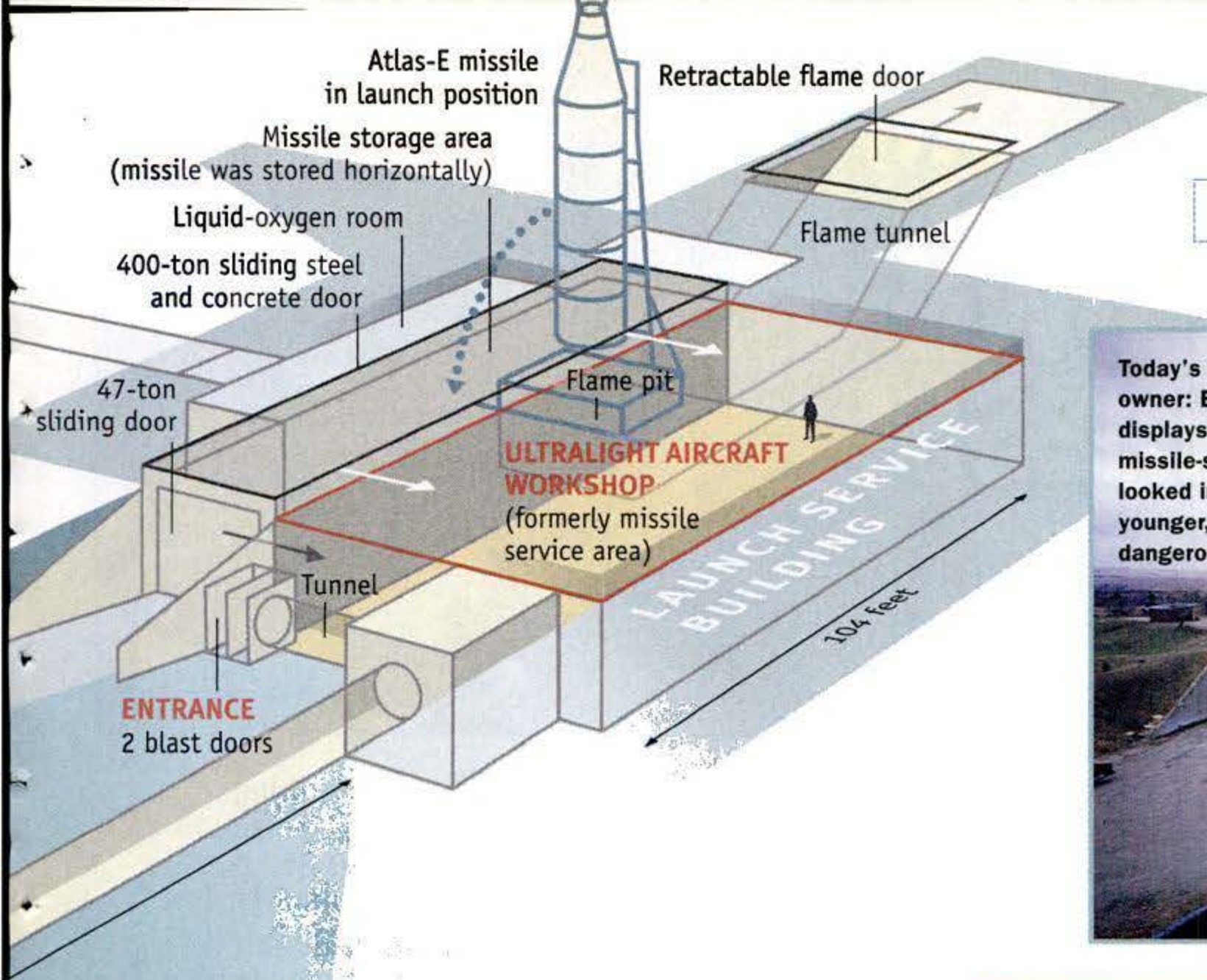

INFOGRAPHIC BY JOHN GRIMWADE

Today's homeowner: Ed Peden displays how his missile-silo house looked in its younger, more dangerous days.

CHARLIE RIEDEL/GAMMA LIAISON (2)

A deck extending from the Pedens' kitchen overlooks an unfinished space that once contained huge generators for the missile facility.

"When I saw it, I thought it was a very special structure," recalls Ed. Most of the 15,000-square-foot complex is hidden beneath Kansas prairie, on a 33.4-acre site near Dover. There, the Pedens are safe not only from nuclear attack and tornadoes, but also from big heating and cooling bills. Eighteen-inch-thick concrete walls and several feet of earth covering the roof help maintain a constant temperature inside, so the Pedens have no need for air conditioning, and use only a small wood stove for heating.

The Pedens' property is a "coffin style" Atlas-E missile site. At such sites, the giant weapon was stored on its side, and a massive concrete-and-steel door in the roof retracted so that the missile could be tilted upright for firing. Ed uses the 110-foot-long missile bay, which has a 47-ton "garage door" on one end, as a hangar for the ultralight flying wings he builds. The Pedens plan to use the 17-foot-deep "flame pit" at the other end of the building to hold several hundred thousand gallons of water for their vegetable garden.

A 120-foot-long corrugated-metal tube leads to a command building that today contains a 2,800-square-foot split-level home. In what is now his living room, Ed says, "men sat ready to fire their missile at a Russian city."

It's utterly quiet indoors, and the Pedens listen to the radio to learn about the weather outdoors. A fiberglass skylight, which has replaced a heavy cement block that once covered an equipment hatch, provides the only natural lighting to the interior.

Sprouting from the earth that covers the Peden house are two 33-foot-tall gray towers that resemble castle turrets. That's intentional. "Missile sites are the castles of this century," explains Ed, "just as the castles of Europe were built by the king for defense."

Ed and two partners have founded a company called Twentieth Century Castles to sell missile sites to others who dream of living in such palaces underground—or simply want a secure place to store wine bottles or to archive documents. The sites available are the Atlas series and the Titan-1s, all constructed in the 1960s. Newer facilities were destroyed when taken out of service, as required by international treaty.

Activated in 1961 and decommissioned only four years later, the Pedens' "semihardened" Atlas-E facility cost $4 million to build. The more than two dozen of these sites that remain sell for upward of $70,000. Peden's company also offers the "superhardened" Atlas-F, which housed its missile in a 176-foot-deep pit under eight feet of earth. Need more room? A Titan-1, with 45,000 square feet and a half mile of tubes, "is like a underground city," says Ed.

The Pedens plan to eventually build a conventional house above their missile site. That would make them the proud owners of the world's largest basement. ◆

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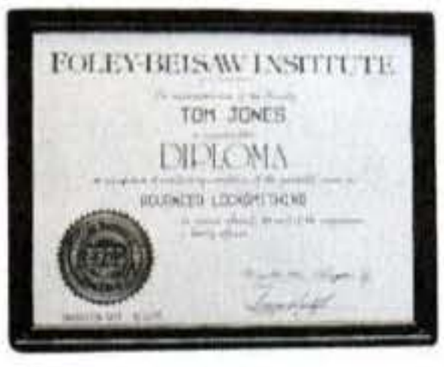

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FYI

EDITED BY CECILIA WESSNER

ASK POPULAR SCIENCE

What causes Wint-o-Green LifeSavers to spark when you bite down on them?

Donnie Todd
Houston, Texas

ACCORDING to LifeSaver, the phenomenon is called "triboluminescence." Kids, the real experts, refer to it as the "electric LifeSaver effect." But whatever you call it, here's how it works: When you crack a sugar crystal by biting down on the candy, it breaks into two oppositely charged pieces. When enough sugar crystals are broken for the difference in charge (voltage) to be large enough, electrons from the negatively charged side jump over to the positive side, colliding along the way with nitrogen molecules in the surrounding air. This collision produces invisible ultraviolet (UV) radiation. That's the first step.

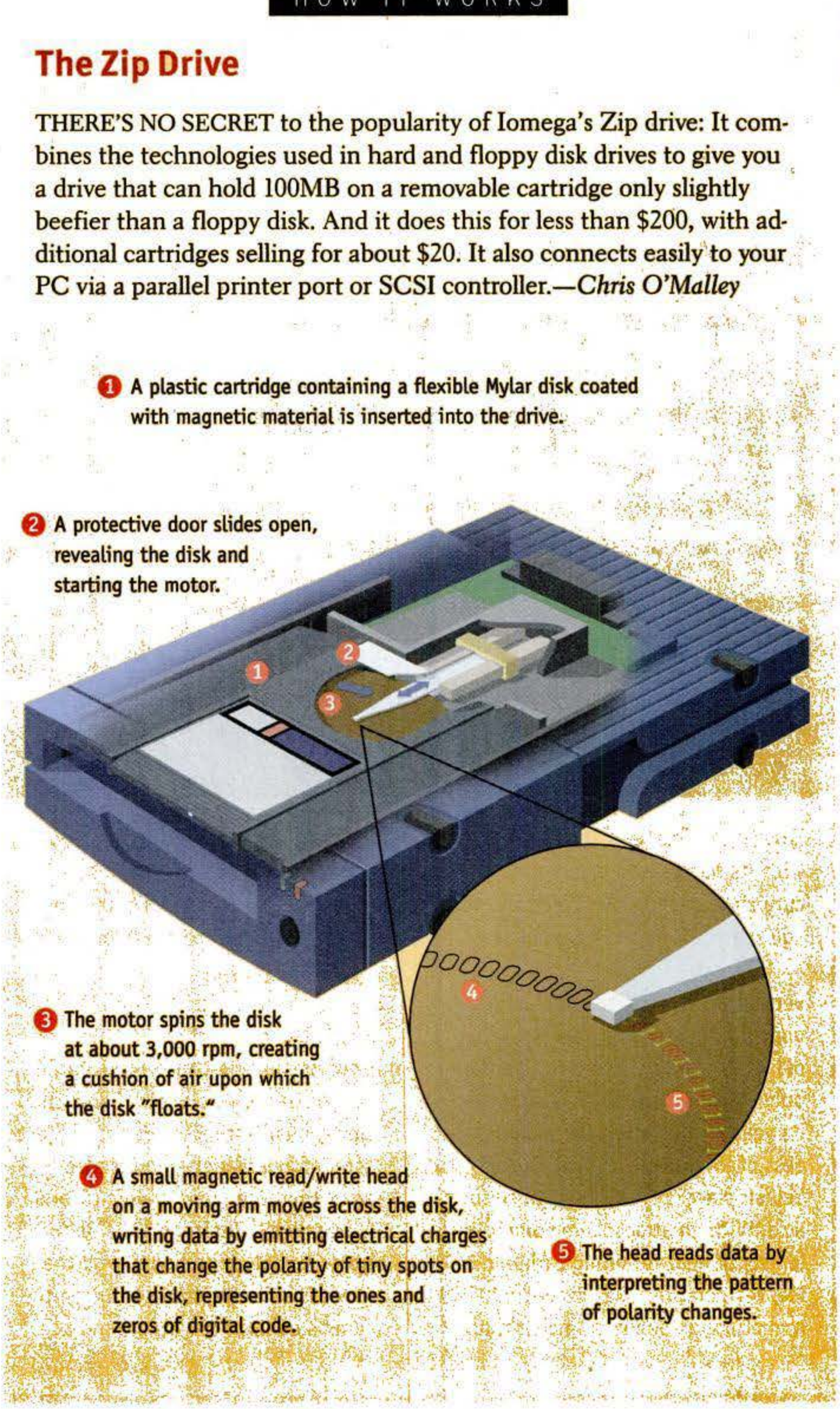
Wint-o-Green LifeSavers contain a flavoring called methyl salicylate. In the next step, this flavoring absorbs the energy from the UV radiation and re-emits it, only this time in a visible wavelength, namely blue. The more wintergreen flavoring there is in proportion to the sugar, the brighter the spark.

Wint-o-Green is the only flavor of LifeSaver that contains methyl salicylate, so only it produces a spark. However, other candies that contain the flavoring, like pink Necco

HOW IT WORKS

The Zip Drive

THERE'S NO SECRET to the popularity of Iomega's Zip drive: It combines the technologies used in hard and floppy disk drives to give you a drive that can hold 100MB on a removable cartridge only slightly beefier than a floppy disk. And it does this for less than $200, with additional cartridges selling for about $20. It also connects easily to your PC via a parallel printer port or SCSI controller.—*Chris O'Malley*



K. DANIEL CLARK

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THE FACTS

Our Cosmic 'Hood

COMPARED WITH the vastness of the universe, our solar system seems rather small. Our neighboring planets still hold secrets, however. Telescopes such as the Earth-orbiting Hubble Space Telescope and planetary probes like the *Galileo* mission to Jupiter have been bringing these neighboring satellites into sharper focus, but, as with the rest of the universe, there is always more for us to discover in the future.—*compiled by William L. Thieriot and Mariette DiChristina*

The Solar System by the Numbers

Name	Distance from Sun (maximum, in millions of miles)	Distance from Sun (minimum, in millions of miles)	Diameter (in miles)	Mass (in "Earths")	No. of satellites	Revolution around sun ("year")	Rotation ("day")
Sun	Not applicable	Not applicable	864,000	332,946	9	Not applicable	26 days
Mercury	43.4	28.6	3,030	0.0553	0	88.00 days	58.7 days
Venus	67.7	66.8	7,520	0.815	0	224.7 days	243 days
Earth	94.6	91.4	7,926	6 sextillion, 588 quintillion tons	1	365.26 days	23.934 hours
Mars	154.8	128.6	4,220	0.1074	2	1.88 years	24.6 hours
Jupiter	507	460.2	88,000	317.89	16-17	11.86 years	9.8 hours
Saturn	937.6	838.8	71,000	95.18	18	29.46 years	10.66 hours
Uranus	1,870.80	1,702.10	32,500	14.54	15	84.01 years	17.24 hours
Neptune	2,824	2,774.80	30,700	17.15	8	164.79 years	16.1 hours
Pluto	4,582.70	2,749.60	1,430	0.002	1	247.7 years	6.4 days

True to the image of speed associated with its namesake Roman god, Mercury zips around its orbit at an average speed of 30 miles per second.

Venus turns clockwise on its axis—opposite in direction from the other planets' rotations. Venus is also the only planet whose day is longer than its year. Named after the Roman goddess of love, Venus is a particularly hellish place: It has clouds of sulfuric acid. With an atmosphere composed largely of heat-retaining carbon dioxide, temperatures may exceed 500°F. And although Venus is smaller than Earth, the carbon dioxide in its atmosphere creates a pressure more than 100 times that of Earth's at sea level.

Even though Mars has been visited by photo-taking spacecraft, its famous canals remain a mystery. The canals appear in some images, but not in all.

More than half of the surface of Mars is a desert of reddish rock. Irregular greenish-looking patches were once thought to be plant life, but they may actually be volcanic salts, the color of which changes with atmospheric conditions. Or, the patches could actually be gray: Against a large, red background, the gray appears to be green to the human eye.

Jupiter, named after the chief Roman god, is truly a giant among planets: It comprises two-thirds the total mass of the sun's planets. Ganymede, Jupiter's largest moon, is the biggest moon of any planet—and is also larger than the planets Mercury and Pluto as well. Jupiter's "day" is so short (roughly nine hours) and the planet is so large that a point on the planet's equator travels around at 22,000 mph as the planet rotates; on Earth, in comparison, a point travels just 1,000 mph.

A string of 21 fragments of the comet Shoemaker-Levy 9 started a six-day hail on Jupiter on July 16, 1994. Traveling at 134,000 mph, the fragments blew out massive plumes of gas when they collided with the planet, forming fireballs and leaving behind dark blotches. One of the largest chunks, the G fragment, struck Jupiter with the force of 6 million megatons of TNT—100,000 times the power of the largest nuclear bomb ever detonated.

In 1995, only the edge of Saturn's famously bright and colorful ring system could be viewed from Earth, enabling astronomers to see two—and possibly four—new satellites.

Each planet rotates around a north pole that is not exactly vertical; Earth, for instance, tips 23 degrees, 27 minutes on its axis. But Uranus takes that to an extreme: Its north pole is tipped 98 degrees, so the planet rotates almost on its side.

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Imagine the seasons on Uranus: The sun rises on the north pole and warms it for 42 years, then sets—and the pole gets Uranian winter and darkness for 42 years.

As with the other gaseous outer planets, Neptune emits more of its own energy than it receives from the sun. Perhaps this is from cooling of the planet's internal heat sources, and from the heat of the original planetary formation.

While Pluto usually is the planet farthest from the sun, Neptune currently holds that distinction—and will until 1999. Pluto's orbit is not only elliptical, so that it crosses Neptune's orbit, but it's also tilted relative to the orbits of the other planets. One day far in the future, Neptune and Pluto will likely collide.

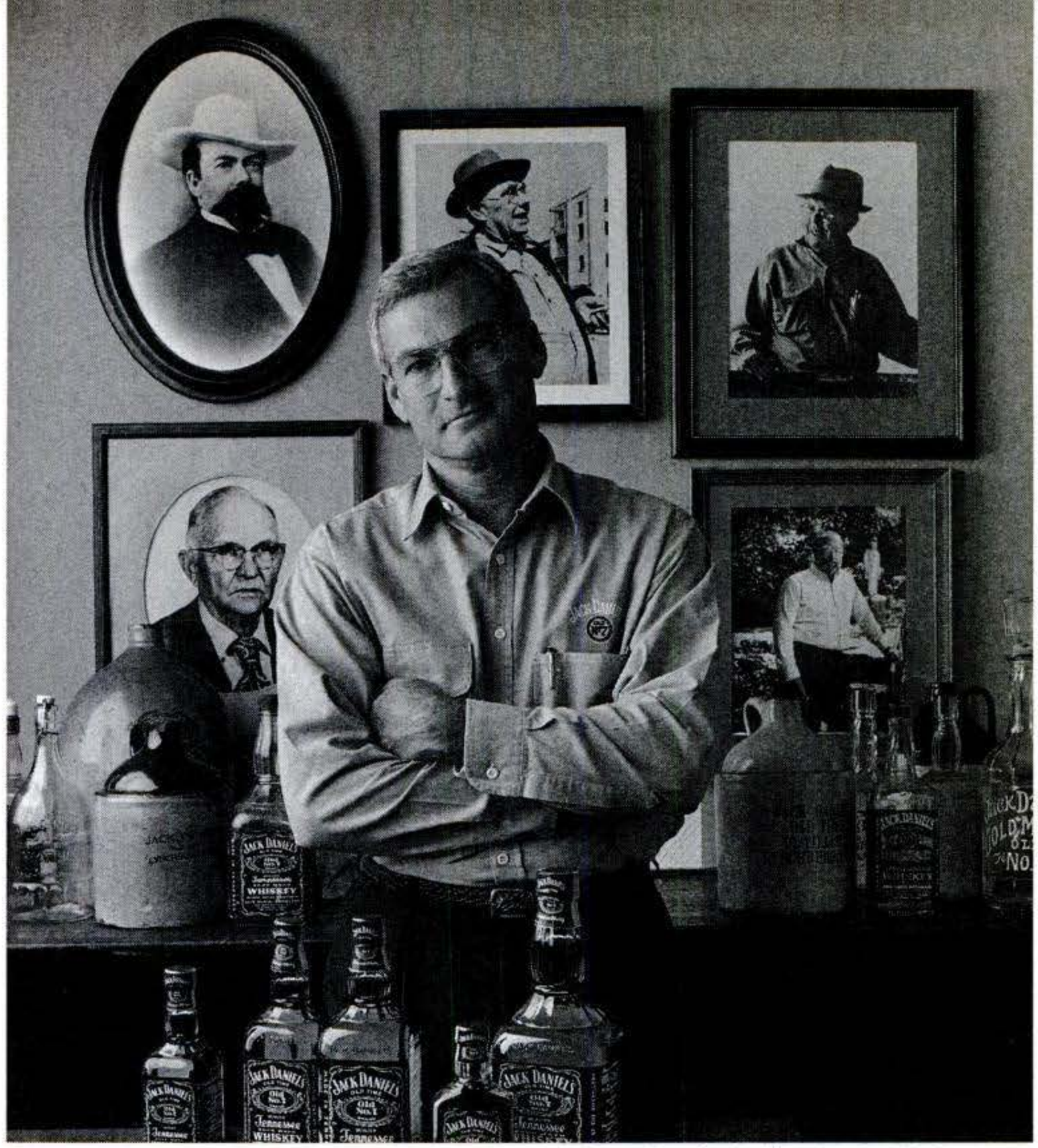
Pluto's sole satellite, Charon, measures 750 miles across—almost half the size of the planet itself. That makes Pluto almost a double planet. Pluto's surface of ice may cover a rocky core.

The sun is 109 times bigger than Earth. Its surface temperature is about 6,000°C, but the interior may reach 13,000,000°C.

The inner planets (Mercury, Venus, Earth, and Mars) are rocky, with metallic cores; the outer planets (except for Pluto) are gaseous giants, each graced by rings.

Triton is the only major planetary moon in the solar system that orbits opposite to the rotation of its parent planet, Neptune. It may have been "captured" by Neptune.

MAIN SOURCE: "The World Almanac and Book of Facts 1996"



Clockwise from top left, that's Jack Daniel, Jess Motlow, Lem Tolley, Frank Bobo and Jess Gamble. (Jimmy's in the middle).

JACK DANIEL'S HEAD DISTILLER, Jimmy Bedford, has lots of folks looking over his shoulder.

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wafers, also flash when crunched.

And if you wire up a Wint-o-Green LifeSaver to a neon tube, then smash the candy with a hammer, the tube will momentarily flash.

What do designations such as WWW2 and WWW4 in Web site addresses indicate? Are they any different from the more common WWW prefix that most sites use?

dtordoff@defiant.flash.net

THE ADDITION of a number to the WWW prefix in a Web site address (such as *http://www.popsci.com*) usually denotes that there's more than one central computer, or "server," fielding access requests for the same site or company, says David Graves, Internet business manager for Network Solutions. This Herndon, Virginia, firm runs the Internet name registry, InterNIC, for the National Science Foundation. But numerical variations can also simply be an organizing scheme within the same Web server.

Incidentally, Web site sponsors need to apply for and receive a unique "domain name" (*popsci.com*, for example) before they can post their pages, but they may use the WWW prefix or not. CNN does not use the WWW in its Web address (*http://cnn.com*), for instance. Sponsors are also free to use any variation on the WWW prefix, which denotes World Wide Web, or an alternative prefix like *web*.

Recently nickel-cadmium, lithium, and alkaline battery manufacturers have started printing "dispose of properly" on their products. How should the public dispose of these household batteries?

Jon March
Naugatuck, Conn.

BY LAW, household batteries—unlike those from commercial sources—can be thrown out with regular garbage. But they contain heavy metals that may leach into groundwater from landfills or enter the air during incineration.

As a result, certain states have opened recycling centers and some counties hold household hazardous waste days when you can take batteries and other potentially toxic products to a collection site. No national figure is available on these programs; contact your county for information about local programs.

In the next few years, though, recycling batteries could become as easy as going to a neighborhood store. Because the EPA has recently ruled that household batteries need no longer be treated as hazardous waste, retail stores and other businesses are now more inclined to serve as collection centers. [See "Coming to a Retail Store Near You," Home Technology Newsfront, Oct.].

Why must hearing-aid batteries be replaced every two to three weeks, while wristwatch batteries last a year or longer?

Carol A. Kus
Parma Heights, Ohio

SIMPLY BECAUSE hearing aids draw more current from batteries than wristwatches do. A watch battery vibrates in measured pulses to power gears. A hearing-aid battery, however, functions continually and must power a mini amplifier, microphone, and speaker. So even though the two devices may often use the same type of batteries, like zinc oxide, a hearing aid sucks up a thousand times more energy each day. ◆

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4. PointCast Inc. developed the PointCast Network—the first news network that broadcasts personalized news and information directly to a viewer's computer screen. Viewers of this service enjoy "pointcasting" - the ability to broadcast breaking news according to the interests of each individual user. Anyone with Internet access can download PointCast at *http://www.pointcast.com*. Free.

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5. Cambridge Soundworks' catalog has specials on systems and components from Philips, Pioneer, Denon, and Cambridge Soundworks, including complete Dolby Surround systems starting at only $999. Free.

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7. Gutter Alternative A two-color brochure from Rainhandler provides information on its patented alternative to gutters. It gently disperses the rain from the roof of your house. There are no downspouts, no clogging, no cleaning, and no trenching. It's made of rugged aluminum that is virtually invisible on your home. Free.

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How much do you read of each of the monthly Newsfront sections?

Automotive Newsfront
☐ All ☐ Most ☐ Some ☐ None

Computers & Software Newsfront
☐ All ☐ Most ☐ Some ☐ None

Electronics Newsfront
☐ All ☐ Most ☐ Some ☐ None

Home Technology Newsfront
☐ All ☐ Most ☐ Some ☐ None

Science & Technology Newsfront
☐ All ☐ Most ☐ Some ☐ None

Please indicate how much you like each Newsfront section. Please rate from 1 to 5, with 5 being most important and 1 being least important.

__ Automotive Newsfront
__ Computers & Software Newsfront
__ Electronics Newsfront
__ Home Technology Newsfront
__ Science & Technology Newsfront

Which Newsfront do you like the least?

☐ Automotive Newsfront
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☐ Electronics Newsfront
☐ Home Technology Newsfront
☐ Science & Technology Newsfront

Tell us why you read the Newsfronts. Please rate from 1 to 5, with 5 being most important and 1 being least important.

__ I like reading stories that are short
__ I like the variety of the stories
__ I like the photos
__ I like the diagrams and illustrations
__ I like to know more about how things work than what I get from "What's New"

What do you think of the length of each Newsfront section?

Automotive Newsfront
☐ Too long ☐ Too short ☐ About right

Computers & Software Newsfront
☐ Too long ☐ Too short ☐ About right

Electronics Newsfront
☐ Too long ☐ Too short ☐ About right

READER POLL

Do you think the rays of the sun present more danger today than they did 10 years ago?

☐ Yes ☐ No ☐ Not sure

Why? _____

MARCH 1996 READER POLL RESULTS

"Should the Internet and online services be regulated?"

Here are the results:

20.7% favor regulation

61.4% do not favor regulation

17.9% unsure if they favor regulation

Of the 20.7 percent of respondents who favored regulation, surprisingly, no one suggested regulation to protect children from adult content.

Home Technology Newsfront
☐ Too long ☐ Too short ☐ About right

Science & Technology Newsfront
☐ Too long ☐ Too short ☐ About right

Tell us how you feel about the general length of the individual items in each Newsfront.
☐ Too long ☐ Too short ☐ About right

Would you like to see more monthly essay columns, such as the Beyond Here column by Gina Smith, added to the other Newsfronts?
☐ Yes ☐ No ☐ Not sure

In which Newsfronts would you like to see columns or essays?

☐ Automotive Newsfront
☐ Computers & Software Newsfront
☐ Electronics Newsfront
☐ Home Technology Newsfront
☐ Science & Technology Newsfront

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☐ Newsstand ☐ Subscription
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Are you male or female?
☐ Male ☐ Female

Please put an "X" in the box that indicates your age:

☐ Under 18 ☐ 40 - 49 ☐ 70 or over
☐ 18 - 29 ☐ 50 - 59
☐ 30 - 39 ☐ 60 - 69

What is your marital status?

☐ Single (never married) ☐ Married
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What is the highest level you completed in school?

☐ Some high school or less
☐ Graduated from high school
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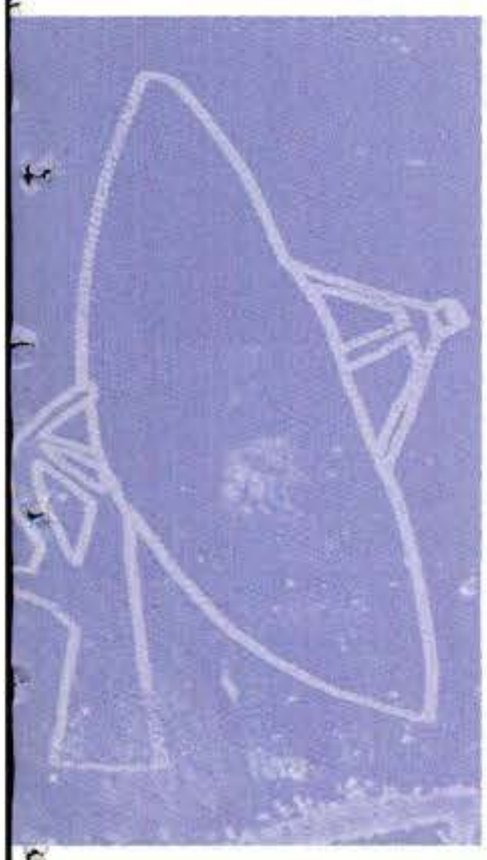
Competition is open to high school students in grades 9 - 12 or equivalent. All essays will be judged by our ACM97 Vision of the Future Committee. Winners will be notified by February 1, 1997.



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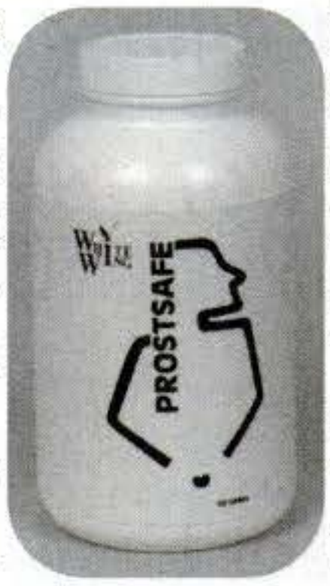
Natural Prostate Relief

Our customers have said Prostsafe™ helps to:
Halt the endless trips to the bathroom during the night!
Stop that burning sensation during or after urination!
Prevent uncontrollable wetting!
Improve bladder control!
Empty bladder completely!
Sit through an entire sports event !

It's a natural fact. If you are a male over 40 and don't already suffer from a prostate gland disorder, the odds are 2 to 1 that you will before you are 59. By the age of 65, most American men have enlarged prostates. As the years pass, mild discomforts can become disabling. Today, prostate surgery is the second most commonly performed surgery for non-cancerous BPH in men over age 65! Some surgical complications can result.



Prescription drugs may halt the swelling, but many prescription drugs may also have side effects. Many doctors feel that disorders of BPH can be treated or prevented by giving the prostate gland the nutrition it lacks.

Recent scientific research has shown how to remedy the underlying problems associated with disorders of BPH -- safely and effectively. These results have been published in the *British Journal of Clinical Pharmacology* and the *American Journal of Gerontology*. They reveal that several vitamins, minerals and natural herbs can dramatically shrink the prostate and improve urinary performance in older men.

The most modern application of these healthy ingredients is found in Prostsafe™ from Whitewing Labs. Prostsafe is the nutritional "tool kit" for men with benign prostate problems, and those who wish to prevent them. It is a mixture of zinc, serenoa serrulata, ginseng, certain amino acids, bee pollen and vitamins A, B-6 and E. These ingredients have been shown to help shrink a swollen prostate.

As little as a dollar a day seems like inexpensive insurance against disorders of BPH. If for some reason you are not satisfied, just return the unused portion within 30 days for a full refund. The reasons why men over 40 use Prostsafe are clear. If you are looking for relief, order Prostsafe today.

Dr. Leslie Atterbury III, M.D., says "Prostsafe supplies essential vitamins, minerals and herbs needed to nourish and maintain a healthy prostate."

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Dear Friend,

I made $9,800 in 24 hours. You may do better!

My name is John Wright. Not too long ago I was flat broke. I was $31,000 in debt. The bank repossessed my car because I couldn't keep up with the payments. And one day the landlord gave me an eviction notice because I hadn't paid the rent for three months. So we had to move out. My family and I stayed at my cousin's place for the rest of that month before I could manage to get another apartment. That was very embarrassing.

Things have changed now. I own four homes in Southern California. The one I'm living in now in Bel Air is worth more than one million dollars. I own several cars, among them a Rolls Royce and a Mercedes Benz. Right now, I have a million dollar line of credit with the banks and have certificates of deposit at $100,000 each in my bank in Beverly Hills.

Best of all, I have time to have fun. To be me. To do what I want. I work about 4 hours a day, the rest of the day, I do things that please me. Some days I go swimming and sailing—shopping. Other days, I play racquetball or tennis. Sometimes, frankly, I just lie out under the sun with a good book. I love to take long vacations. I just got back from a two week vacation from—Maui, Hawaii.

I'm not really trying to impress you with my wealth. All I'm trying to do here is to prove to you that if it wasn't because of that money secret I was lucky enough to find that day, I still would have been poor or maybe even bankrupt. It was only through this amazing money secret that I could pull myself out of debt and become wealthy. Who knows what would have happened to my family and me.

Knowing about this secret changed my life completely. It brought me wealth, happiness, and most important of all—peace of mind. This secret will change your life, too! It will give you everything you need and will solve all your money problems. Of course you don't have to take my word for it. You can try it for yourself. To see that you try this secret, I'm willing to give you $20.00 in cash. (I'm giving my address at the bottom of this page.) I figure, if I spend $20.00, I get your attention. And you will prove it to yourself this amazing money secret will work for you, too!

Why, you may ask, am I willing to share this secret with you? To make money? Hardly. First, I already have all the money and possessions I'll ever need. Second, my secret does not involve any sort of competition whatsoever. Third, nothing is more satisfying to me than sharing my secret only with those who realize a golden opportunity and get on it quickly.

This secret is incredibly simple. Anyone can use it. You can get started with practically no money at all and the risk is almost zero. You don't need special training or even a high school education. It doesn't matter how young or old you are and it will work for you at home or even while you are on vacation.

Let me tell you more about this fascinating money making secret:

With this secret the money can roll in fast. In some cases you may be able to cash in literally overnight. If you can follow simple instructions you can get started in a single afternoon and it is possible to have spendable money in your hands the very next morning. In fact, this just might be the fastest *legal* way to make money that has ever been invented!

This is a very safe way to get extra cash. It is practically risk free. It is not a dangerous gamble. Everything you do has already been tested and you can get started for less money than most people spend for a night on the town.

One of the nicest things about this whole idea is that you can do it at home in your spare time. You don't need equipment or an office. It doesn't matter where you live either. You can use this secret to make money if you live in a big city or on a farm or anywhere in between. A husband and wife team from New York used my secret, worked at home in their spare time, and made $45,000 *in one year.*

This secret is simple. It would be hard to make a mistake if you tried. You don't need a college degree or even a high school education. All you need is a little common sense and the ability to follow simple, easy, step-by-step instructions. I personally know a man from New England who used this secret and made $2 million *in just 3 years.*

You can use this secret to make money no matter how old or how young you may be. There is no physical labor involved and everything is so easy it can be done whether you're a teenager or 90 years old. I know one woman who is over 65 and *is making all the money she needs* with this secret.

When you use this secret to make money you never have to try to convince anybody of anything. This has nothing to do with door-to-door selling, telephone solicitation, real estate or anything else that involves personal contact.

Everything about this idea is perfectly legal and honest. You will be proud of what you are doing and you will be providing a very valuable service.

It will only take you two hours to learn how to use this secret. After that everything is almost automatic. After you get started you can probably do everything that is necessary in three hours per week.

Here's what newspapers and magazines are saying about this incredible secret:

The Washington Times:
The Royal Road to Riches is paved with golden tips.

National Examiner:
John Wright has an excellent guide for achieving wealth in your spare time.

Income Opportunities:
The Royal Road to Riches is an invaluable guide for finding success in your own back yard.

News Tribune:
Wright's material is a MUST for anyone who contemplates making it as an independent entrepreneur.

Success:
John Wright believes in success, pure and simple.

Money Making Opportunities:
John Wright has a rare gift for helping people with no experience make lots of money. He's made many people wealthy.

California Political Week:
...The politics of high finance made easy.

The Tolucan:
You'll love...*The Royal Road to Riches.* It's filled with valuable information...only wish I'd known about it years ago!

Hollywood Citizen News:
He does more than give general ideas. He gives people a detailed A to Z plan to make big money.

The Desert Sun:
Wright's *Royal Road to Riches* lives up to its title in offering an uncomplicated path to financial success.

PROOF

I know you are skeptical. That simply shows your good business sense. Well, here is proof from people who have put this amazing secret into use and have gotten all the money they ever desired. Their initials have been used In order to protect their privacy, but I have full information and the actual proof of their success in my files.

'More Money Than I Ever Dreamed'

"All I can say—your plan is *great!* In just 8 weeks I took in over $100,000. More money than I ever dreamed of making. At this rate, I honestly believe, I can make over a million dollars per year.

A. F., Providence. RI

'$9,800 In 24 Hours'

"I didn't believe it when you said the secret could produce money the *next morning.* Boy, was I wrong, and you were right! I purchased your *Royal Road to Riches.* On the basis of your advice, $9,800 poured in, in less than 24 hours! John, your secret is incredible!"

J. K., Laguna Hills, CA

'Made $15,000 In 2 Months At 22'

"I was able to earn over $15,000 with your plan—in just the past two months. As a 22 year old girl, I never thought that I'd ever be able to make as much money as fast as I've been able to do. I really do wish to thank you, with all of my heart."

Ms. E. L., Los Angeles, CA

'Made $126,000 In 3 Months'

"For years, I passed up all the plans that promised to make me rich. Probably I am lucky I did—but I am even more lucky that I took the time to send for your material. It changed my whole life. Thanks to you, I made $126,000 in 3 months."

S. W., Plainfield, IN

'Made $203,000 In 8 Months'

"I never believed those success stories...never believed I would be one of them...using your techniques, in just 8 months, I made over $203,000...made over $20,000 more in the last 22 days! Not just well prepared but simple, easy, fast...John, thank you for your *Royal Road to Riches!"*

C. M., Los Angeles, CA

'$500,000 In Six Months'

"I'm amazed at my success! By using your secret I made $500,000 in six months. That's more than twenty times what I've made in any single year before! I've never made so much money in such short time with minimum effort. My whole life I was waiting for this amazing miracle! Thank you, John Wright."

R. S., Mclean, VA

As you can tell by now I have come across something pretty good. I believe I have discovered the sweetest little money-making secret you could ever imagine. Remember—I guarantee it.

Most of the time, it takes big money to make money. This is an exception. With this secret you can start in your spare time with almost nothing. But of course you don't have to start small or stay small. You can go as fast and as far as you wish. The size of your profits is totally up to you. I can't guarantee how much you will make with this secret but I can tell you this—so far this amazing money producing secret makes the profits from most other ideas look like peanuts!

Now at last, I've completely explained this remarkable secret in a special money making plan. I call it "The Royal Road to Riches". Some call it a miracle. You'll probably call it "The Secret of Riches". You will learn everything you need to know step-by-step. So you too can put this amazing money making secret to work for you and make all the money you need.

To prove this secret will solve all your money problems, don't send me any money, *instead postdate* your check for a month and a half from today. I guarantee not to deposit it for 45 days. I won't cash your check for 45 days before I know for sure that you are completely satisfied with my material.

$20.00 FREE!

There is no way you can lose. You either solve all your money problems with this secret (in just 30 days) or you get your money back *plus* $20.00 *in cash* **FREE!**

Do you realize what this means? You can put my simple secret into use. Be able to solve all your money problems. And if for any reason whatsoever you are not 100% satisfied after using the secret for 30 days, you may return my material. And then I will not only return your original UNCASHED CHECK, but I will also send you an extra *$20.00 cashiers check* just for giving the secret an honest try according to the simple instructions.

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SWORN STATEMENT:

"As Mr. John Wright's accountant, I certify that his assets exceed one million dollars." Mark Davis

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Introducing The Sex Education Videos That Increase Sexual Pleasure For Both Partners.

Ordinary Couples, Extraordinary Sex is an all new video series from the Sinclair Institute, America's premier producer of exciting sex education videos for adults. Developed by Dr. Sandra Scantling, one of America's most renowned sex educators and counselors, *Ordinary Couples, Extraordinary Sex* is an astonishing combination of visual excitement, sexual intensity and emotional intimacy.

Each hour-plus video illustrates a path to sexual pleasure as revealed by loving couples who permit us to view the intimate details of their private lives. Many couples find that their interest in each other increases substantially after watching these videos. And Dr. Scantling shows how to transform that interest into life-long sexual pleasure.

Here are some comments from people who have previewed these videos:

"Some of the demonstrations are exquisitely intense."

"Sharing these couples' explicit emotional and physical intimacy produces stronger sexual responses than I ever imagined possible."

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Ordinary Couples, Extraordinary Sex is being offered at a special price of $19.95 for each video or $49.85 for all three. All orders will also receive a free 28 minute video on *Advanced Sexual Positions* and our new brochure filled with videos and other adult products designed to help you spice up your relationship.

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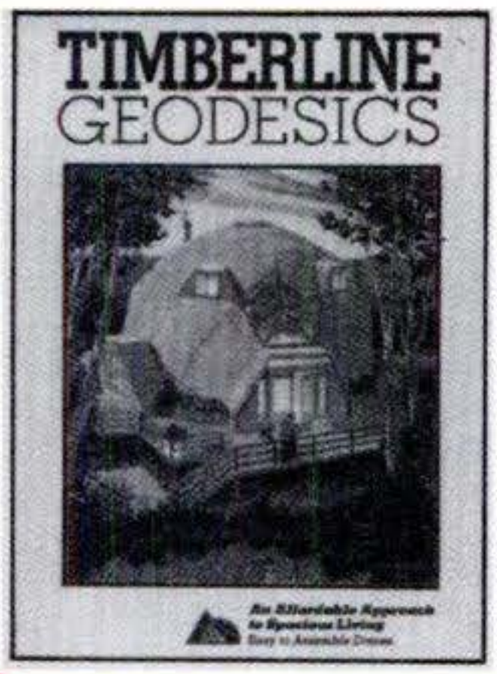

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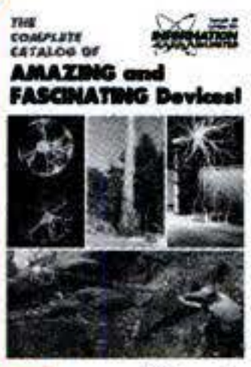

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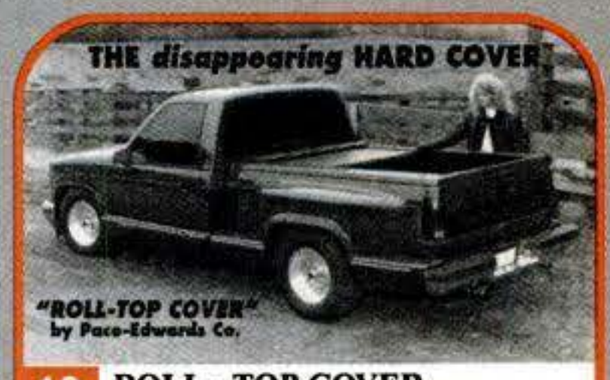

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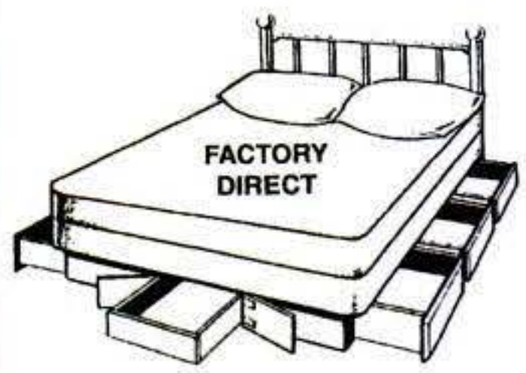

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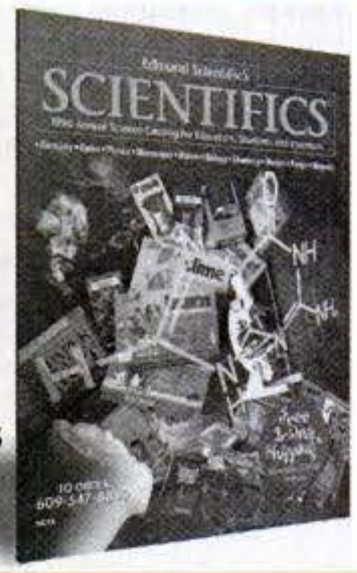

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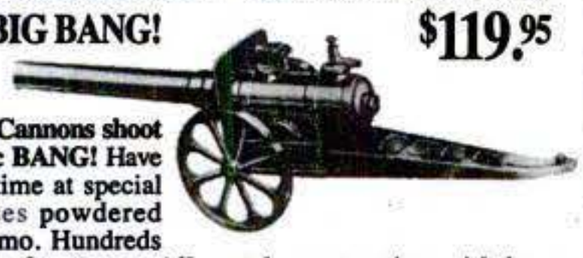

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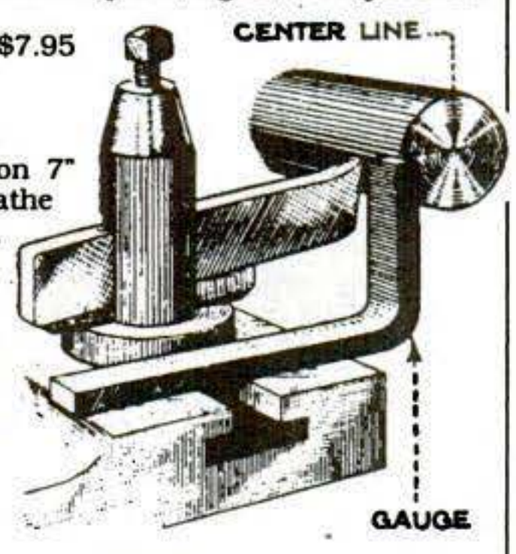

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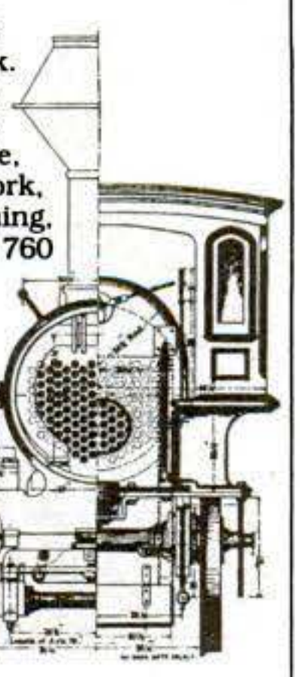

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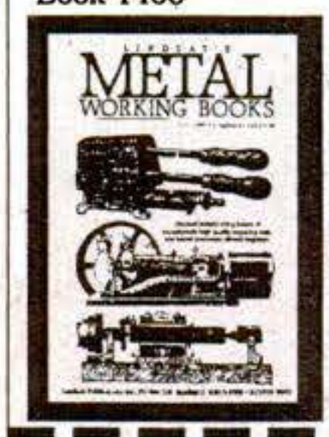

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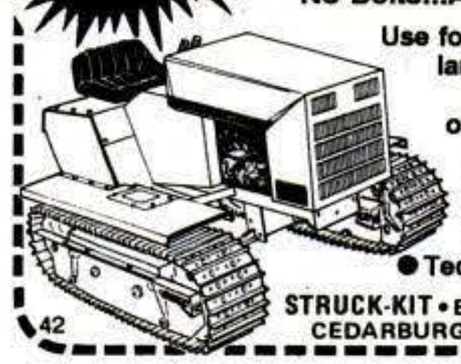

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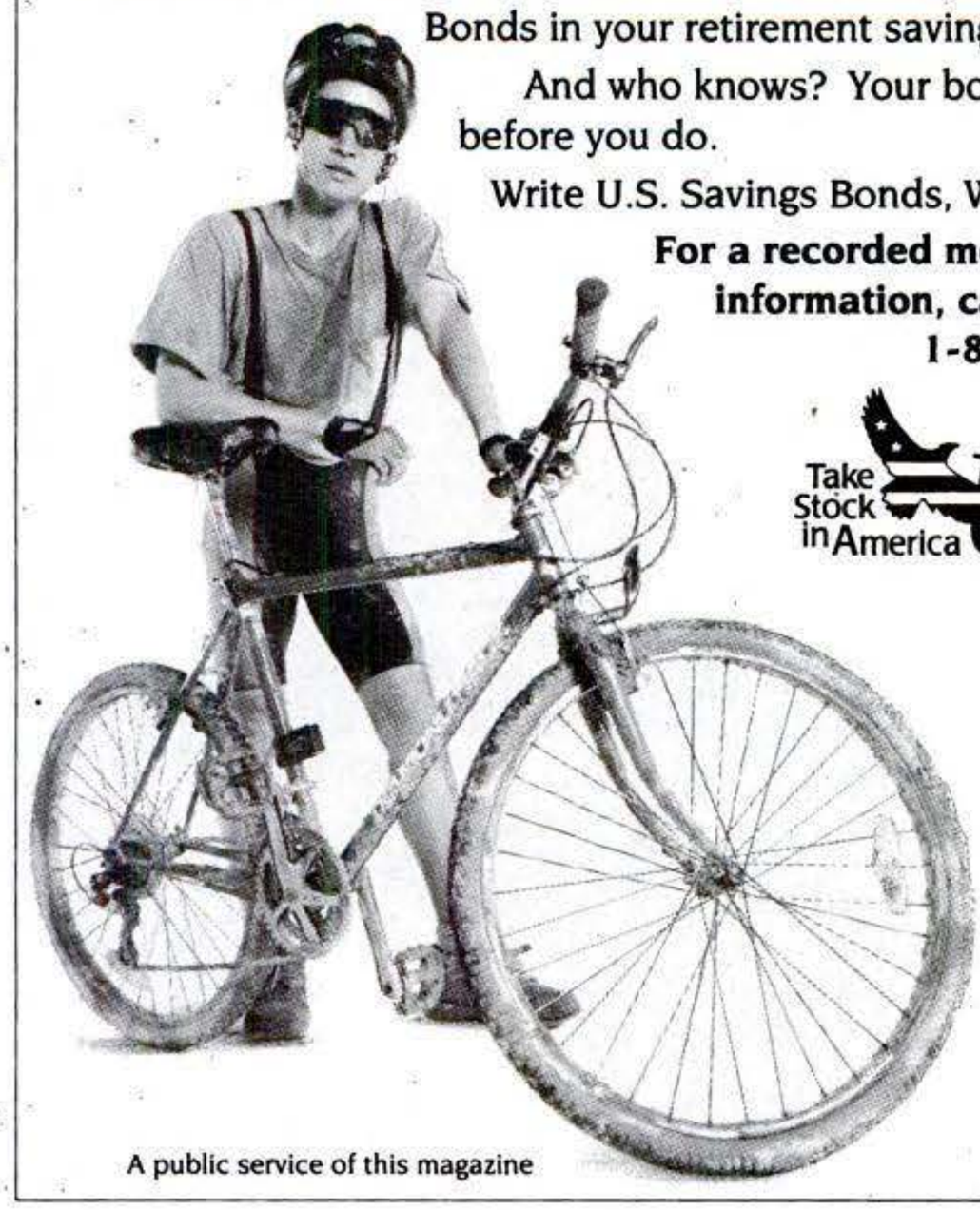

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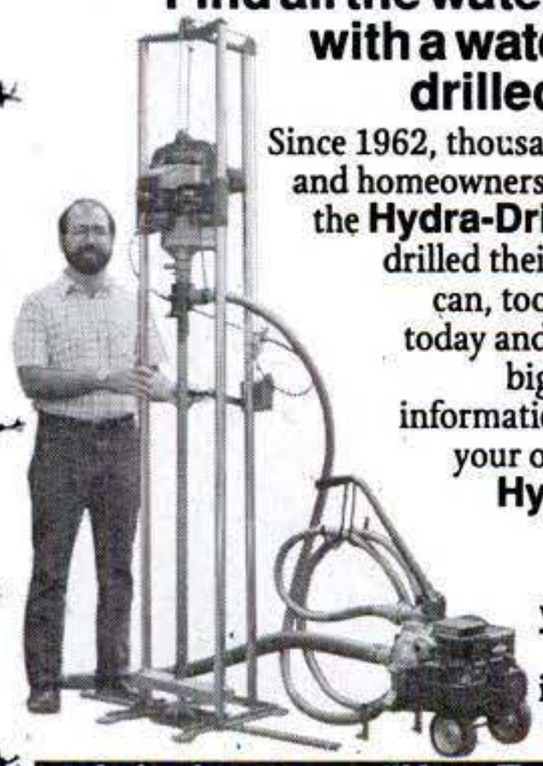

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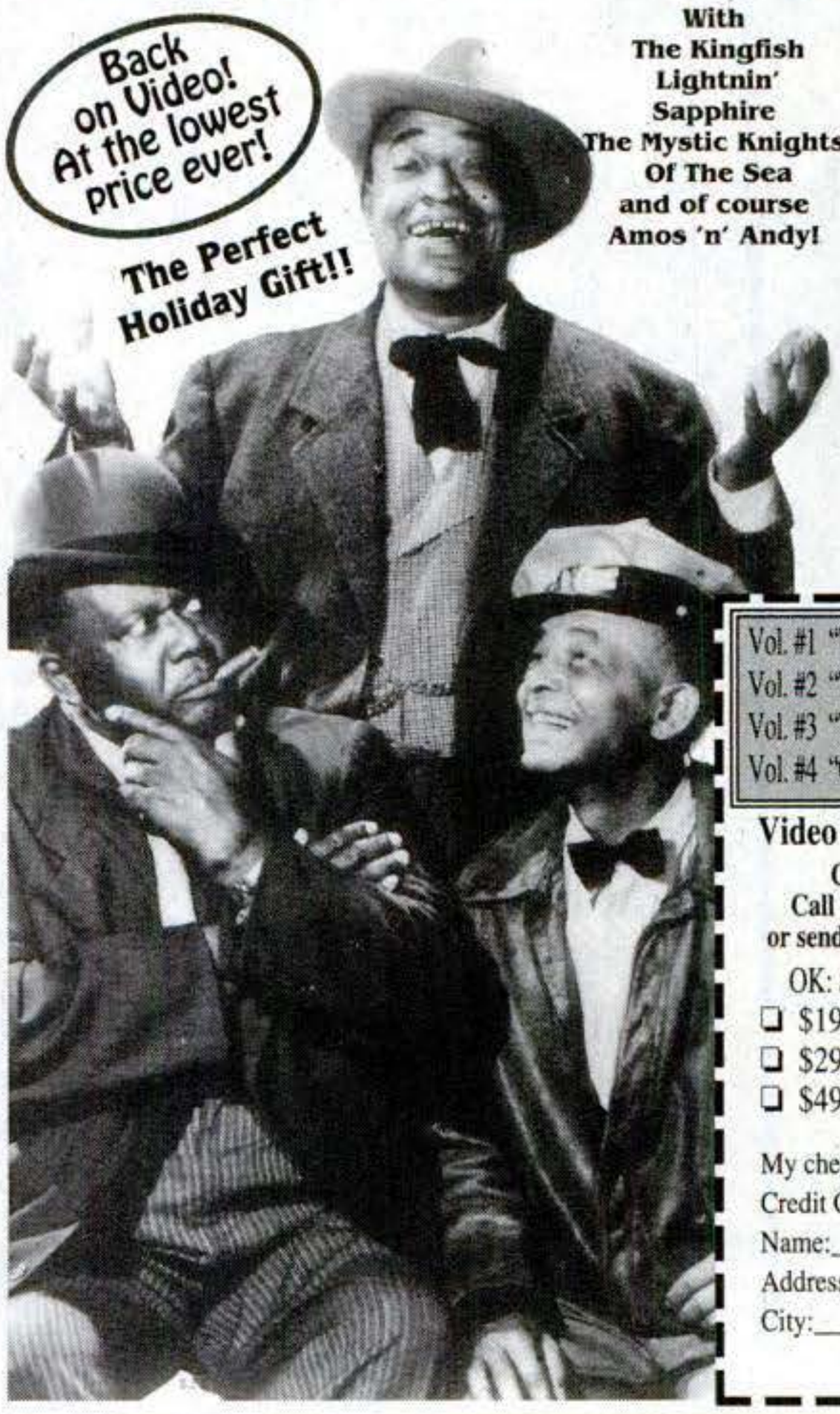

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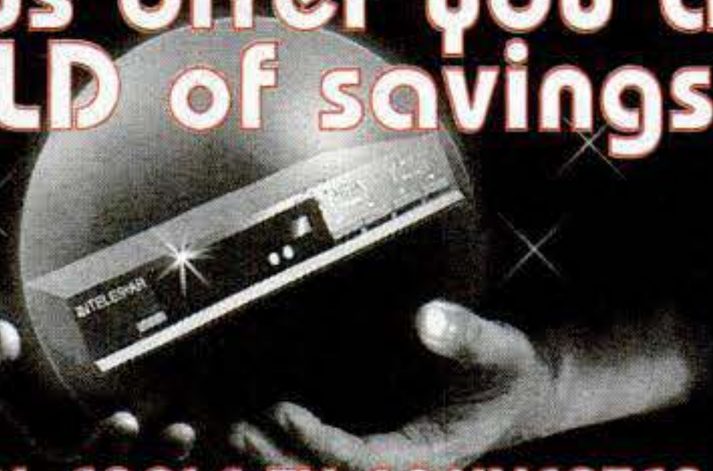

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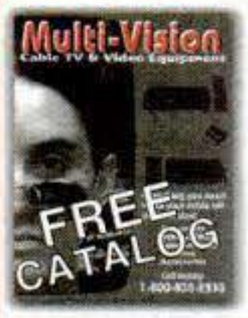

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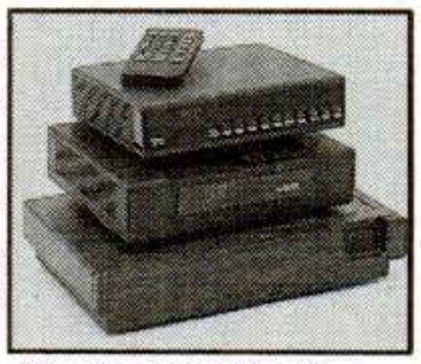

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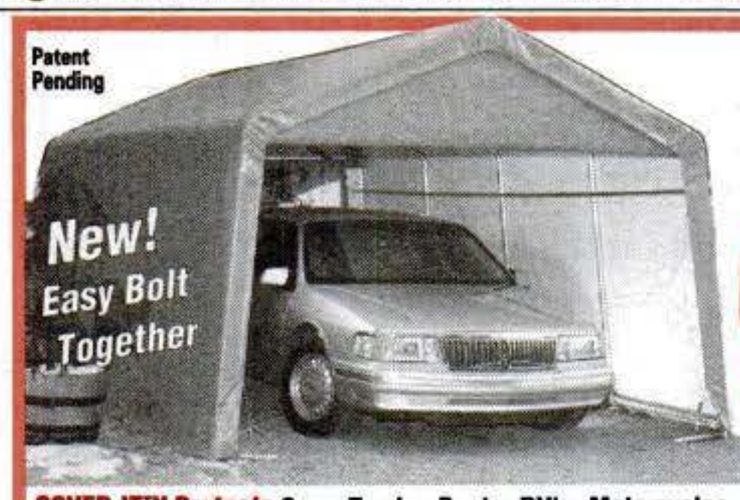

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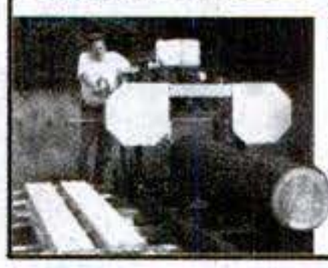

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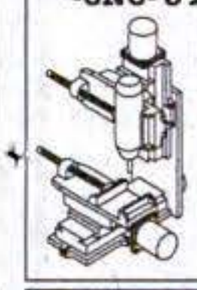

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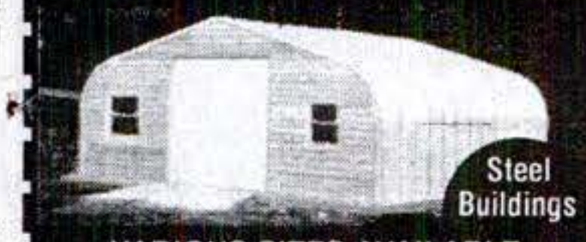

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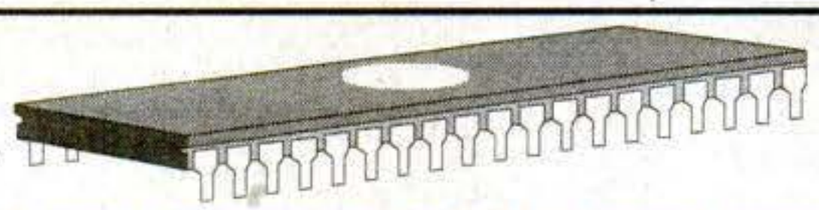

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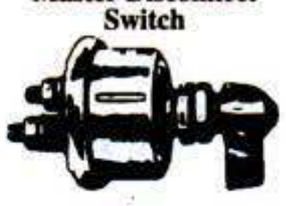

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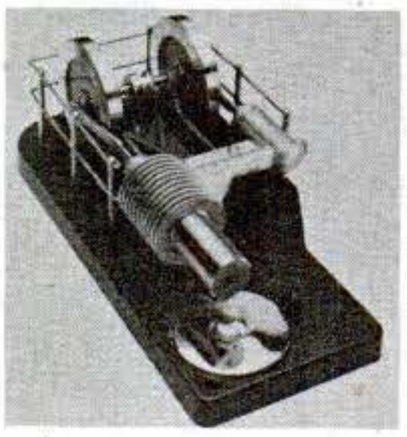

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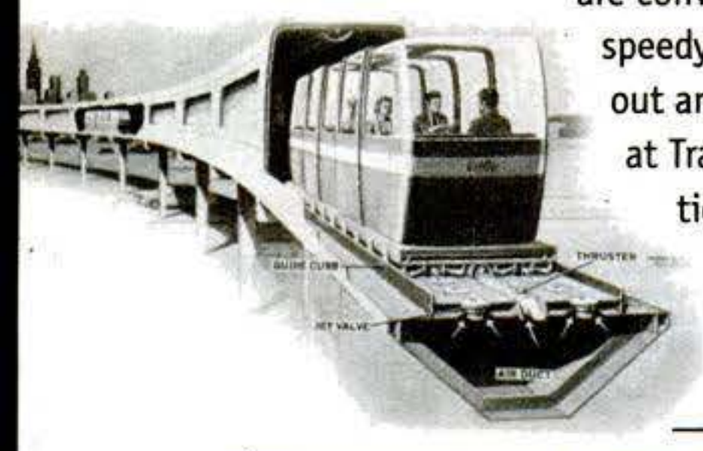

PRTs were envisioned as small, automated cars that take a few riders to destinations they select themselves, without having to make stops in between. But, beyond some limited applications, this vision has yet to be efficiently exploited. Some futurists still see them as the wave of tomorrow. PRT projects are being considered in Chicago, Rosemont, and Schaumburg, Illinois. [See "Wheels for Hire," Science Newsfront, December '95].

Grumman Hatches a Mallard

50 YEARS AGO OUT OF Grumman Aircraft's "preserve" at Bethpage, Long Island, the Mallard has risen to fly with the growing U.S. amphibious flock. Bigger than its predecessors, the Duck, Widgeon, and Grey Goose, the sleek airplane is scheduled for full production by early winter. Grumman expects flocks of this type of plane to be used in metropolitan areas that have both water and land ports.—*November 1946*

Grumman built 59 of these planes in the next five years. One briefly shuttled New Yorkers between Long Island and Manhattan and another flew photographers around the city for the (New York) Daily News. *Some Mallards are still flying today, according to Grumman.*

Mariner 9 to Mars

25 YEARS AGO THE FIRST U.S. attempt to orbit another planet will be made this month as *Mariner 9* swings around the red planet. Our first long, close-up look at this puzzling planet will be a 90-day scientific spectacular.—*November 1971*

NASA's new series of Mars explorations begins this year with the launches of the Mars Global Surveyor *orbiter and the* Pathfinder *lander and microrover [see "Bulletin: At Last, Company," October].*

The Rise of Aquariums

100 YEARS AGO THE AQUARIUM is altogether a modern institution. Its practicality appears to have been prominently brought before the public by an Englishman, Mr. W. Alford Lloyd, who during the 1860s took part in the founding of the aquariums of Paris and of the Crystal Palace in London. Due to his efforts, aquariums became fashionable throughout Europe and the great cities vied with each other in their prompt efforts to build and equip them. —*November 1896.*

Looking through the largest window in the world, visitors to California's Monterey Bay Aquarium have a view of the largest ecosystem on earth ["Window on the Open Ocean," July].

The aquarium opened in March. In 2001, a deep-sea exhibit debuts, drawing animals from the Monterey Bay Canyon—twice as deep as the Grand Canyon.

Wake Up to Wireless

75 YEARS AGO NEW, LOW-PRICED receiving sets now bring amazing wireless adventures to every home. Broadcasting of news by radiophone, and of lectures, addresses, and concerts is being carried on from many cities. Farmers are receiving weather and crop reports from their state capitals. The area of 125,000 square miles directly covered by radiophone reports of the Dempsey-Carpentier fight is small in comparison with the area that will soon be covered by nightly broadcasts on every conceivable subject.—*November 1921.*

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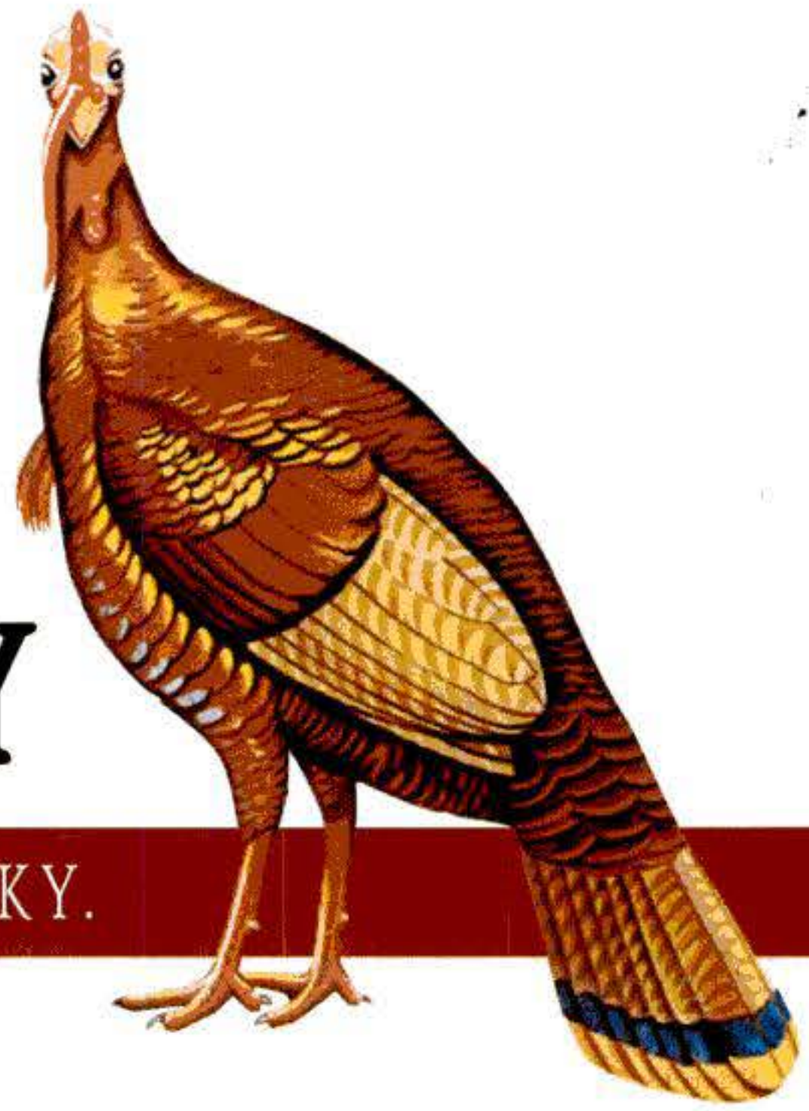

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